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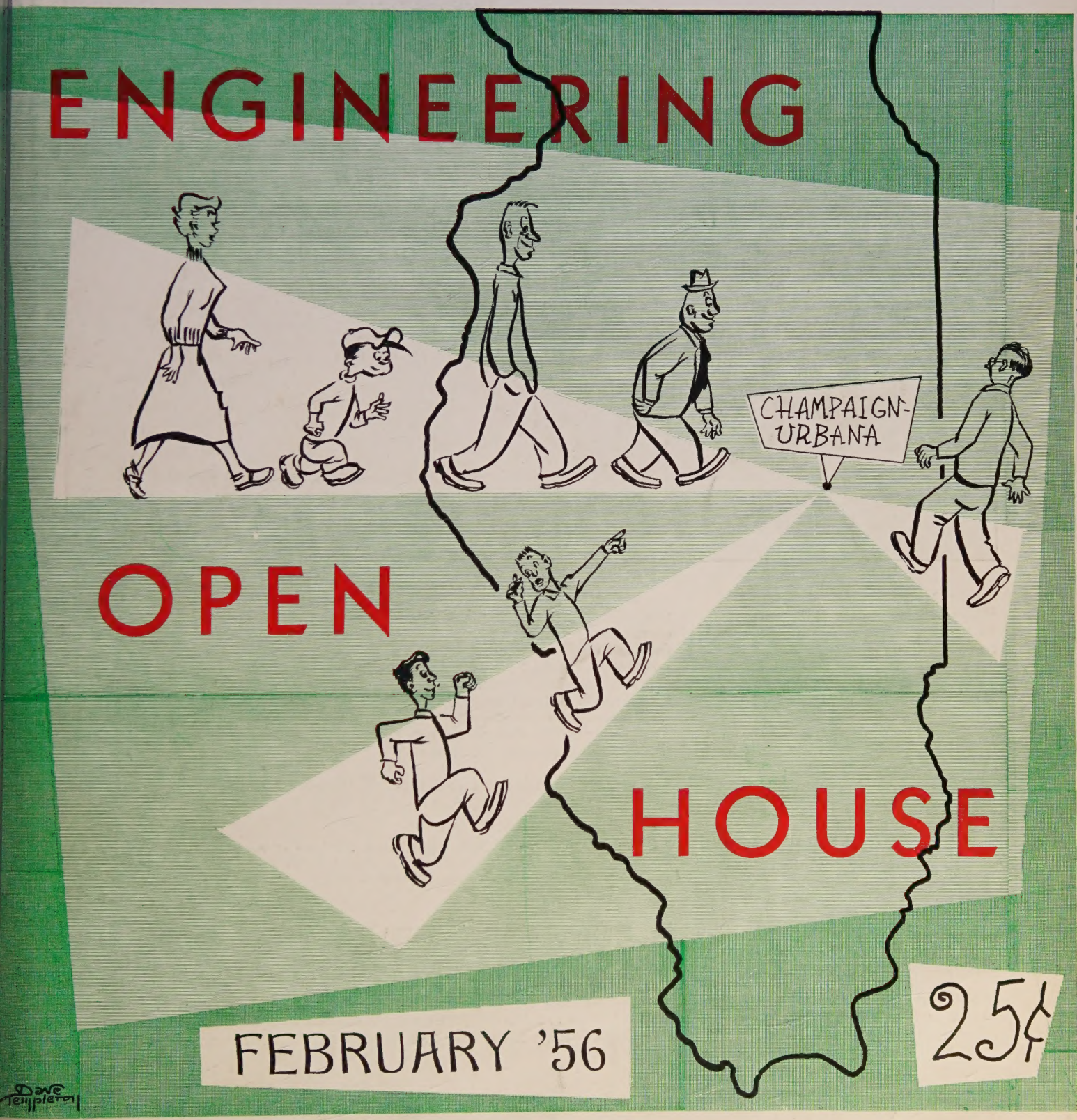
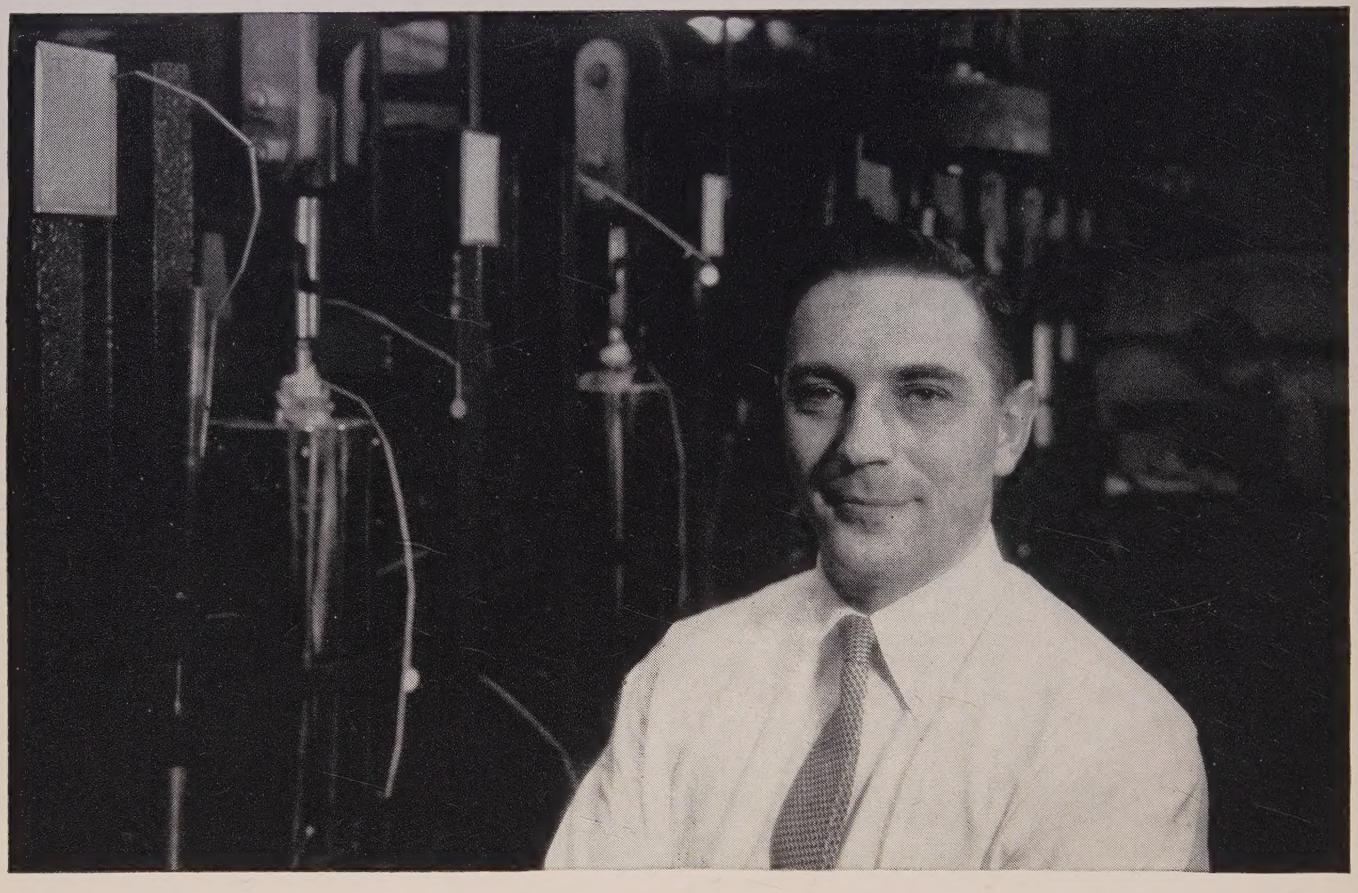
ILLINOIS TECHNOGRAPH



John A. Bauscher, *Class of '43*
speaks from experience when he says . . .

"United States Steel offers first-rate opportunities in research and product development"



JOHN BAUSCHER graduated from college in 1943 with a B.S. degree in Metallurgy. After a stint in the Navy, he returned to college as a metallurgical research assistant. In 1949 he received his M.S. in Metallurgy and then came to work at the U.S. Steel Applied Research Laboratory. After just four and a half years, Mr. Bauscher had progressed to Division Chief for Sheet Products Development – responsible for the improvement of present sheet steel products and the development of new and improved types.

Why did Mr. Bauscher choose U.S. Steel? Because, says he, "U.S. Steel produces such a great diversity of products and maintains such a thorough research program on all its products – not only theoretical research, but also applied research or product development. The graduate engineer has unusual latitude in selecting the type of products and the type of research that interest him most. Work is done not only on steel, but on many raw materials and by-products as well.

"And," says Mr. Bauscher, "Opportunities at U.S. Steel are better now than ever before because of the emphasis on product development and the recent expansion of research facilities."

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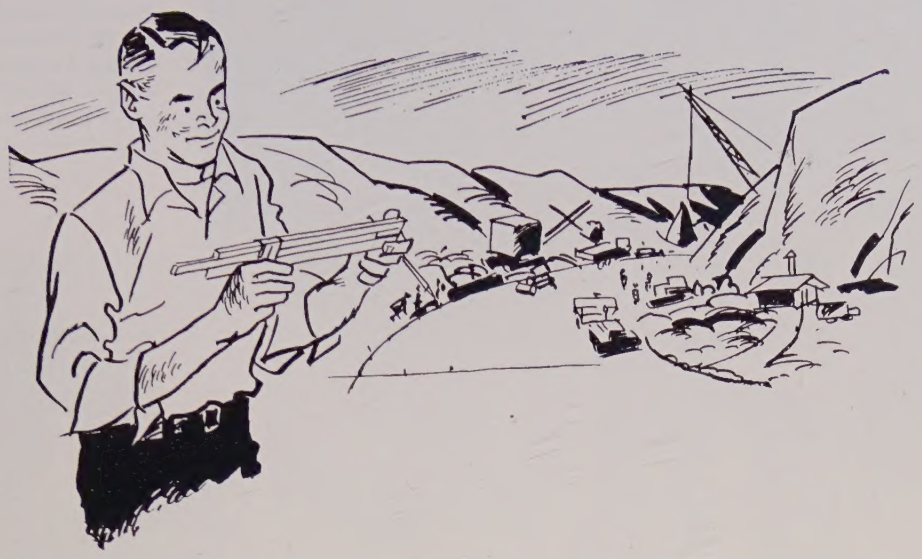


An Engineer . . .

What is an engineer?

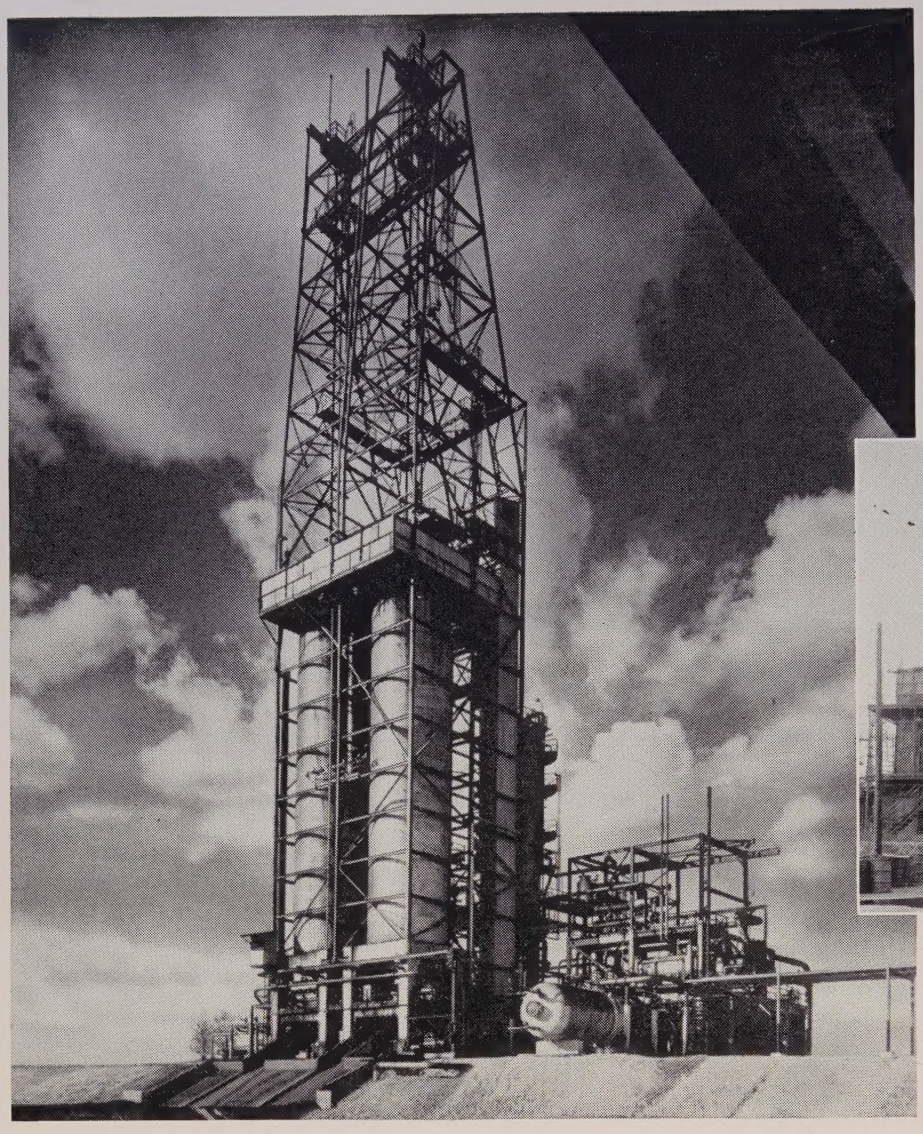
Those of you who are visiting campus for Engineering Open House are looking forward to entering the profession, but probably aren't quite sure what an engineer is. You February freshmen are in the same boat. Ask an LAS, or other type of non-engineering student, and he'll give you a ready answer. An engineer to him is a non-cultured boor, who thinks he's going to run or ruin the whole world. Ask an engineering student and he'll say he's so busy studying to be one, he doesn't have a chance to think about it. Read the magazines, or newspapers, and you will see that the engineer is the front man in the development of American know-how for building bigger and better weapons and bigger and better instruments of peace.

An engineer is more than an attachment to a drawing board or accessory to a slide rule, or unlearned, yet high-salaried technician.

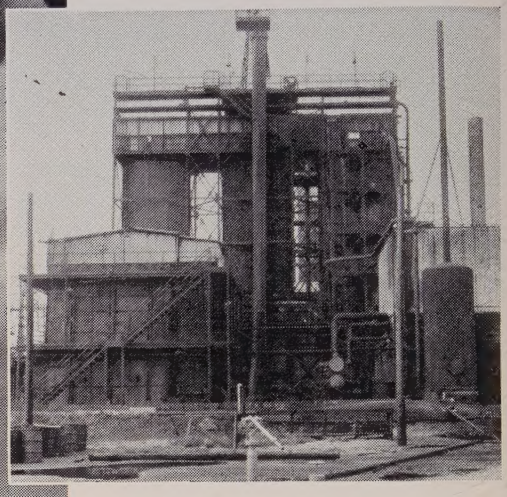
Engineers of today are the executives of tomorrow and that's no joke. The man who becomes an engineer, if he sticks to IT, becomes a dedicated man. It's easy to take the courses offered in colleges of engineering and think you're it. But you're not. You're not an engineer until you are a citizen as well as a technician. The ever-increasing demands upon the profession compel it to come out from behind its drafting table and take its own seat at the table of working, acting, thinking leaders of America.

Not only must the engineer recognize this, but the public must also be aware. That is why we have Engineering Open House and why we have National Engineering Week. To let the people know, "what is an engineer."

H. R. H.



This towering modern unit at the El Dorado, Ark., refinery of Pan-Am Southern Corporation, a Standard Oil subsidiary, produces 700 tons of coke daily.



Standard's original delayed coking unit at Whiting recently celebrated its 25th birthday "on stream" and going strong.

How to make an exception prove a rule

TECHNOLOGICAL PROGRESS is rapid in the petroleum industry. Few processes have a chance to "grow old" on the job. Most are killed off through the combined efforts of thousands of scientists working constantly to improve everything we do, make or use in our business.

Every now and then, though, we experience a happy exception to this rule. That occurs when a new development not only meets the immediate need but also provides the right answer to situations yet unforeseen.

Twenty-five years ago last August a process known as "delayed coking" was invented. The new process made a quicker, cleaner job of converting heavy residual oil into gasoline, gas oil, and coke. It paid off spectacularly when catalytic cracking was invented and these giant new units began calling for feed. It paid off again when the diesel locomotive came along to put the heavy oil burning steam locomotive out of business.

Dr. Robert E. Wilson, chairman of the board of Standard Oil today, was the inventor of delayed coking. Almost all of the young scientists who worked with him in its development are still with Standard too, in responsible positions requiring their special skills.

Young scientists in research and engineering at Standard Oil today find it satisfying to see their creative efforts translated into valuable product and process improvements.

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THE ILLINOIS TECHNOGRAPH

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Our Cover

All roads lead to Champaign-Urbana, scene of the Engineering Open House March 9 and 10. High school students and other interested persons from all parts of the state will attend to witness the exhibits.

Our Frontispiece

This slightly out of date picture shows a large part of engineering campus looking northeast. Missing is the Mechanical Engineering Building which now stands in the lower right corner.

Engineering Open House

UNIVERSITY OF ILLINOIS

March 9-10, 1956

+

The Dean invites you . . .

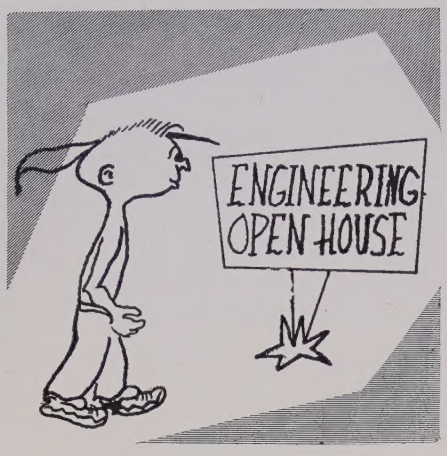
Through the medium of the *Technograph,* I wish to add my own cordial invitation to that of the student body and the student societies in the College of Engineering. I hope that high school students, teachers, families, and citizens of Illinois will come to visit us on this occasion, and will both gain information and enjoy themselves as we ourselves do in studying and practicing engineering. Each year we of the staff and administration watch with pride as the students organize, prepare, and present their Engineering Exhibits. It is a fine example of the professional spirit of public interest and public service which they are learning here at Urbana.

As instructors we are therefore doubly happy to reinforce and to support their efforts. We particularly like to extend our welcome and hospitality with theirs, and look forward to having you as our guests—students and advisors, school administrators, relatives or friends, industrial representatives, University alumni, and all our citizens who are interested in their University and its work in science and technology. You will find that the exhibits and displays are joint projects, with students and instructors cooperating to prepare and explain both student activities and instructional facilities.

Through its students, Undergraduate and graduate, in twelve departments, its graduates, its teaching and research staffs, its buildings and equipment, the College of Engineering both serves the State of Illinois and maintains an international reputation. We look forward to showing you something of this enterprise on Friday, March 9 or Saturday, March 10, and on both days if you find it convenient to stay that long. We hope you will be able to see a little of what our students are learning and accomplishing, to get a better understanding of what modern engineering is and how it is related to and at the same time differs from pure science. Finally, we trust you will enjoy with us an enlightening departure from the rigors of professional discipline to an effort at explaining how interesting and how much fun engineering can really be! We will try to answer your questions, and to keep you entertained.

Sincerely,

W. L. Everitt, *Dean*



1956 Engineering

OPEN HOUSE

by Richard Bauer, M. E. '59

The planners of the University of Illinois' first engineering Open House, an exhibit staged by the Physics Department in 1906, would certainly have to admit that next month's all-engineering spectacle towers above their modest production of 50 years ago in scope, depth and achievement. But they would certainly never admit that the planners of this March's Engineering Open House have conceived their displays with a sounder or more concrete purpose. For despite 50 years of mushrooming and breathtaking expansion in all fields of science and engineering, the engineers who plan such an Open House, both the '06 and the '56 version, all strive toward of pair of common goals:

(1) to prove to the people and industries of Illinois and the nation that there is no such word as "static" in any field of science, be it research, production, or management.

(2) to offer to the prospective engineer an idea as to the duties necessitated by any particular phase of engineering as well as the training and type of individual that such a field requires.

And while no program lists it as such, the student engineers who produce the exhibits add a third purpose to the list by the fulfillment of the first two. In working as a part of a team, the men who plan the Open House receive a type of training that fuses the education and ingenuity of many individuals into a close-knit team that can apply what they have learned in the attacking of a given problem. This type of team is the backbone of our nation's industry and technology.

Evolving from the 1906 physics Open House, the March Engineering Open House answers the demand that was put on the various departments as each department tried to produce such an affair individually. Closely following the physics exhibits of 1906, the Department of Electrical Engineering organized a similar show in the spring of 1907 as a fund raising campaign for a memorial in memory of Robert Fulton. As with the physics displays, the electrical exhibits met with surprising popularity. Encouraged, the department held further shows, each more elaborate than its predecessor. The 1915 show, marked by the first commercial exhibits from outside companies, found the exhibits in several other buildings besides the now too small E. E. Laboratory. By 1924, the yearly display demanded the efforts of some 500 students and a budget of $4,000 that still allowed its planners to finish the project with a profit. Many large concerns, well aware of the national prominence Open House commanded, eagerly offered their products for exhibition. The use of such commercial talent led to many unusual and spectacular demonstrations, and this condition existed until the period extending from 1938 to 1942 when emphasis was removed from commercial work and more effort was made to spotlight student action.

Productions by the various departments between 1906 and 1928 included many small "open houses," most noteworthy among these being a display by the Department of Mechanical Engineering that produced four shows between the years 1914 and 1919 and an all-engineering Open House held for the first time in 1920 commemorating the centennial of the birth of James Watt.

In 1928, a program was established whereby the all-engineering Open House would be held on the alternate years with the E. E. program, thereby avoiding conflict in schedule. Both programs

Hot metals are poured into cast before a recent Open House audience at the foundry exhibit.

were disbanded during the war years. In 1948 the E. E. program and the newly formed Engineering Open House were merged in an open house that was produced biennially. Working on an experimental basis, the program was tried annually in 1952 and 1953 and met with such success that it was left as an annual affair. The 1956 Engineering Open House represents the fifth time that the show has appeared as an annual event.

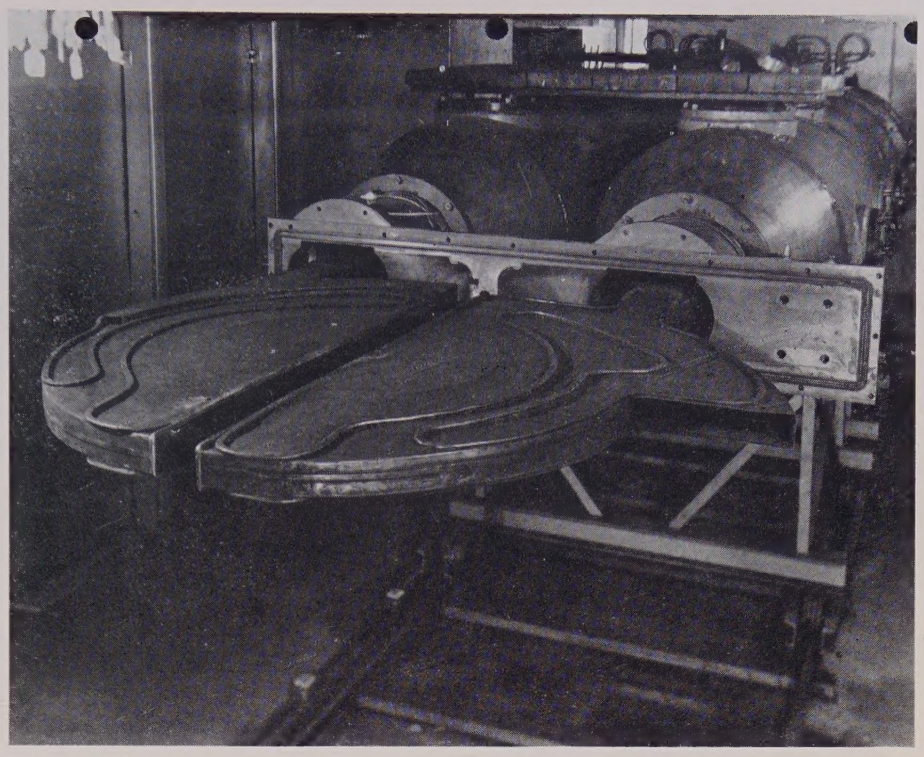
The first physics Open House in 1906 featured the then startling displays of heat, light, and sound science that are now standard text in high school science courses. The exhibits in this year's Open House, as in 1906, show the technological advances of our present day science. Of the myriads of exhibits to be on display, some are startling and are designed purely for showmanship. Others, equally startling and impressive, are used strictly for a utilitarian purpose, giving parallel to the old adage of truth being stranger than fiction. Still others give glimpses at the story of everyday engineering in industry. All are designed to demonstrate to the public some of "the fundamental principles upon which the science of engineering is based upon and to point out how the student is equipped to utilize these principles during and after his course of study."

As in the past, this year's Engineering Open House is arranged according to departments and subdivided by curriculum. The visitor to the campus will see exhibits in each of the engineering buildings and laboratories on the engineering campus as well as a variety of exhibits at the college of agricultural engineering. Length and detail make it impossible to describe each exhibit but special recognition is due to a few exhibits that command both state and national recognition in the fields of science.

—The cyclotron. This instrument of physics research is capable of accelerating deuterons to an energy of 10 million electron volts and to investigate the interaction of heavy particles with each other and atomic nuclei. The machine is housed in a separate building adjoining the nuclear radiations laboratory.

—The betatron. Located in the new Physics Research Laboratory, the 75-million volt betatron is the largest of the three university betatrons, the other two being 4-million and 20-million volt machines. The 75-million volt machine has served as a pilot model for the 400-million volt machine that is now being used for research.

—The Illiac. On display for the second time at the Engineering Open House is the million-dollar Illiac, the University's electronic digital computer. It is one of the few digital computers of its size in the United States and the world. During most of the Open House the Illiac will be working actual problems which have arisen from research programs being carried out at the university. It will be stopped from time to time during the program for special demonstrations.



The cyclotron is capable of accelerating deuterons to an energy of 10 million electron volts. The "Dees" of the cyclotron are shown here.

—Concrete stress tester. Located in the Arthur Newell Talbot Laboratory, this machine is one of the largest in the Midwest. Four stories high, the tester has a pressure capacity of three million pounds. Failure of concrete such as the one pictured in this article causes jars that actually shake the entire building.

Less spectacular but equally interesting displays will be found in other engineering buildings on the campus. The Civil Engineering Hall will have exhibits from structural, construction, survey, sanitary, highway, hydraulics, and railway engineering. Each section will display from one to seven exhibits depicting some phase of their particular field.

The Electrical Engineering Building features exhibits in electronics, magnetism, and light. The Mathematics Department will present displays consisting of the basic symbols of math and three dimensional representation of many geometric and algebraic expressions.

The aeronautical engineering laboratories will feature models of rocket and jet motors, a wind tunnel in action, and an action view of what a shock wave looks like.

The list goes on. Mechanical, Agricultural, Mining, Metallurgy, Ceramics, Physics, and Chemistry; all are represented.

The Open House will offer many features besides the actual exhibits. Most departments plan to show films describing some particular phase of their field, actual classroom work, and explaining the scope that their field encompasses. Many exhibits will offer free samples such as the Ceramics department plans to do. Pieces of enameling and whiteware, all produced in the ceramics laboratories, will be either given or be on sale for a nominal price.

Most important of all perhaps is the fact that both faculty and students will be at the exhibits to answer any question about their field, its opportunities, the types of schooling required, the demand for such men, salary, etc. This should be of special interest to any prospective young engineers. A detailed program of the Open House listing each particular project and its location will be obtainable for all visitors along with many other informative publications from each department.

Distillation columns, filter presses, diamond drilling, black light, 50-caliber machine guns, water turbines, servomechanisms, amplydine generators, and high fidelity displays give only a fleeting cross section glimpse at this massive effort on the part of students and faculty to present the 1956 Engineering Open House. A tremendous program has been planned to give the people of Illinois the story of tomorrow's engineer and the role he must play. Don't miss it.

Graduate Engineers

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"I'm a metallurgical engineer, Class of '51. I wanted to get into development work, so I started with Electro Metallurgical Company in their Metals Research Laboratories in Niagara Falls. Three years' research work in steels and titanium gave me the technical background I needed. Now I'm working on applications of titanium as a development engineer."

"I'm a mechanical engineer, Class of '49. I started in the Tonawanda, N. Y., laboratories of Linde Air Products Company. In a few months I was doing research in low-temperature rectification and heat transfer equipment. Now I'm a Section Engineer, responsible for a group of research and development engineers—a member of LINDE's management team."

"I'm a chemical engineer, Class of '50. I started with Bakelite Company, in their training program for production. Now I'm Assistant Department Head at the main plant in Bound Brook, N. J. The group I direct handles resin quality control and technical service. BAKELITE gave me the chance to rise to a significant position in management."

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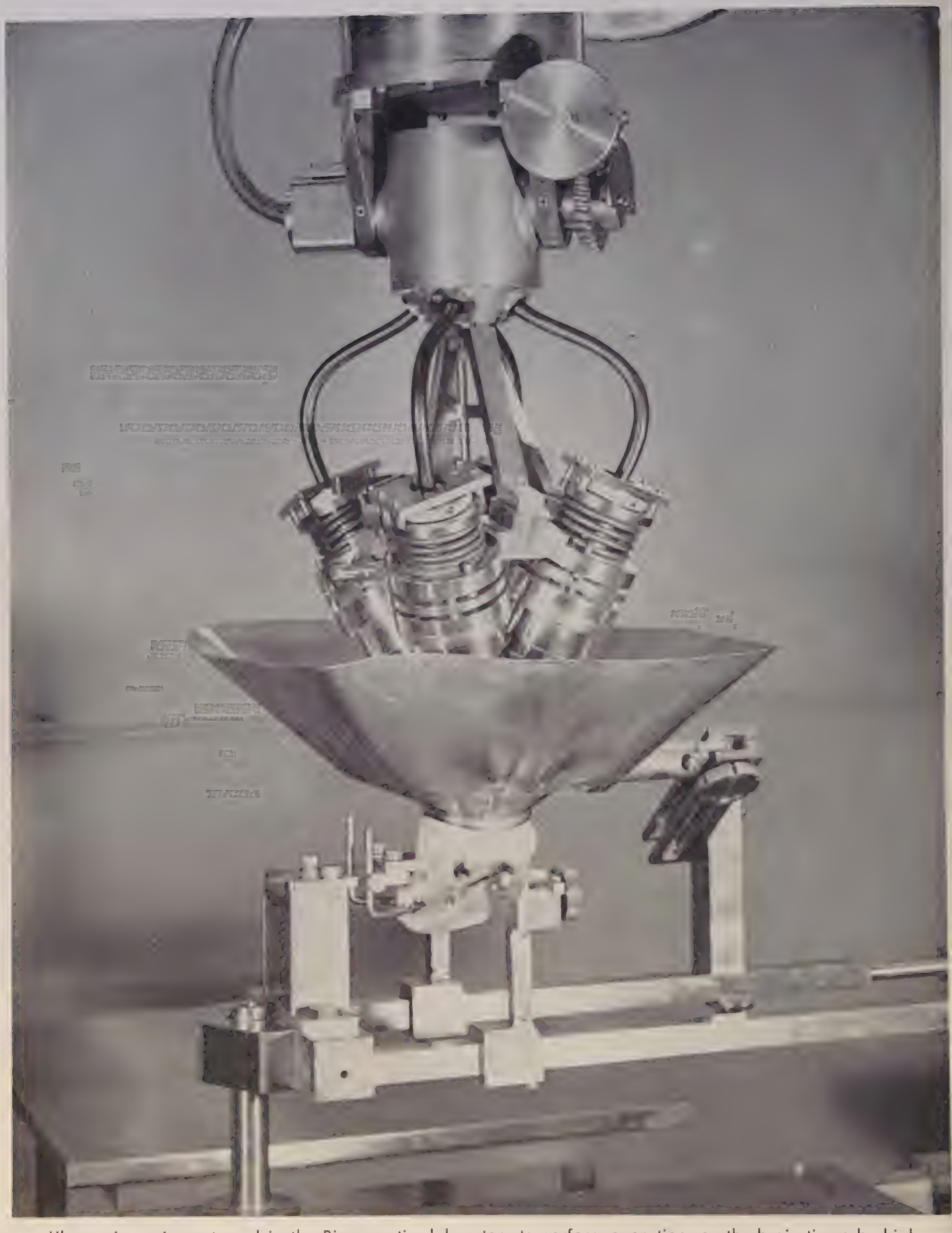
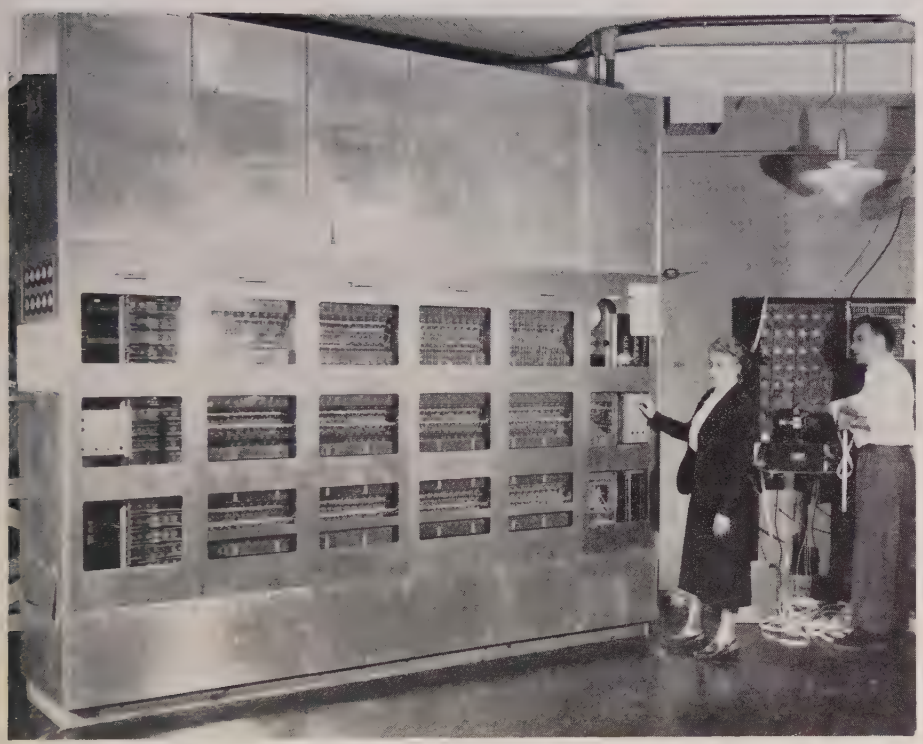


Ultrasonic equipment used in the Bio-acoustics laboratory to perform operations on the brain tissue by high frequency sound.

Research at Illinois

by Glenn Andrews, Aero E. '56



Illiac, the University's electronic digital computer is one of the few of its size in the United States. It will be working actual problems which have arisen from research problems during Open House.

Progress in the scientific fields has become vitally important in this world of international tension. Whether or not America can gain or keep a technical superiority depends upon the stress laid upon research in the different technological fields. The University of Illinois is well known for its research in all phases of science and has on numerous occasions been a pioneer in scientific development.

It is the purpose of this article to present a general survey of the research being conducted at the University and to give the reader an idea of the extent of these research programs.

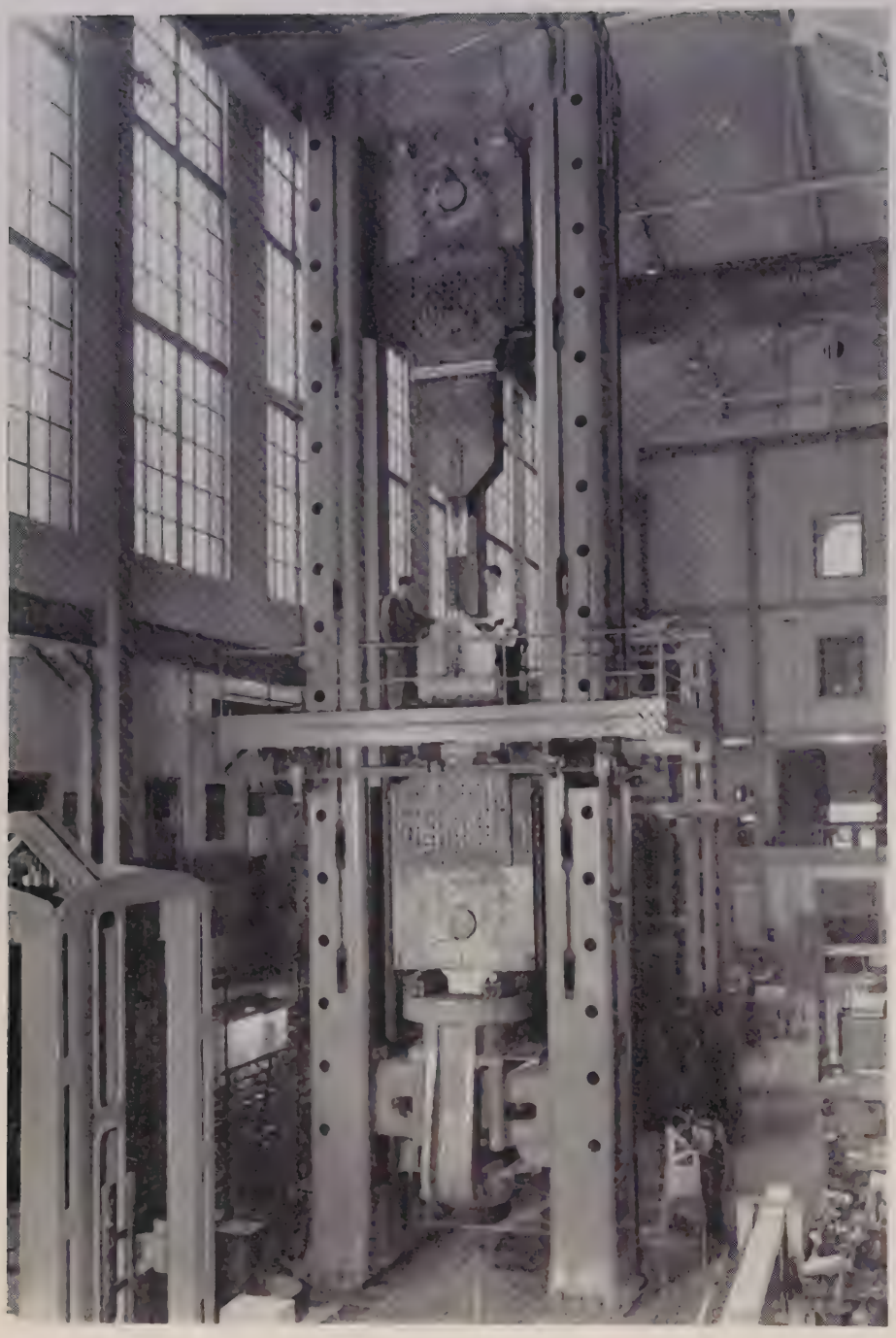
One of the major research fields is that of Physics. Enrolled in the department are approximately 150 graduate students. Many of these are employed by the department as teaching or research assistants and about 60 are in various stages of Ph.D. thesis research. On the senior staff there are 35 who participate in teaching, full or part-time, and about 25, including post-doctoral fellows, who devote full time to basic research in various programs, many of which are supported by various Federal agencies.

The research and training programs currently most active in the department can be classified as nuclear physics, physics of solids and theoretical physics with some work in chemical physics and biophysics.

The betatron and cyclotron, and studies in radioactive decay constitute the research program in nuclear physics. Much of the progress made in the field is credited to Professor Donald W. Kerst. Professor Kerst first accomplished in 1940 at the University of Illinois, what scientists for years had been trying to achieve. He built a machine that could produce electrons with energies of millions of volts for direct use and to create equally high energy x-rays, which would have many uses. His first machine produced 2½-million volt x-rays. The present 340-million volt betatron can produce cosmic rays in the laboratory, in abundance, and with precise control. This is quite a step forward from the experiments of scientists in the past, who have had to travel to mountain tops where cosmic rays are more plentiful in order to study the effects of their high energies. Smaller betatrons are used in medicine for destroying cancers without damaging or injuring other tissues. High energy betatron x-rays also allow industrial engineers to save time and money by taking pictures through thick metal castings and forgings to reveal flaws before starting further work.

The cyclotron is used to accelerate protons, deuterons and alpha particles to energies of 6-, 12-, and 24-million electron volts respectively. They are used in the study of nuclear reactions induced by particle bombardment.

The physics of solids research program, which was initiated in the department in 1949, has developed rapidly. At present active experimental and theoretical research is in progress on such problems as the electrical behavior of metals at extreme temperatures and radiation damage and atomic diffusion is solids. Investigation is also being conducted in the electrical and optical properties of ionic crystals and the behavior



Talbot Laboratory's 3-million lb. testing machine is used extensively in structural research. Professors W. H. Munse and N. M. Newmark inspect a first shear failure of a riveted joint at 700,000 lb. of force.

of materials at very low temperatures using liquid helium.

The University has well equipped departments of Chemistry, Mathematics, Electrical Engineering, Metallurgy, and Biology and close cooperation has developed with each of these in borderline fields of science. Many members of the Physics department are highly skilled in electronics and its applications to physical research.

Research in electronics for its own sake is a major field in the Electrical Engineering department. The electrical engineers have options for research and study in any of the three areas of communications and electronics, power engineering, or illumination.

Considerable research is being done in the study of antennas and propagation and the application of electro-magnetic theory to problems of radiation and reception. Current investigations are in progress on different sizes and configurations of antennas. The radio direction finding research laboratory has an antenna installation at the University Airport for development of direction finding equipment and research on ionspherically-radiated waves.

In physical electronics, research is done on electrons in a vacuum, in gases, and in solids. Most of the research in the area is organized into individual projects directed by a graduate faculty member and sponsored by outside agencies. The newly developed field of transistors and their application in electronic circuits is of special interest to equipment manufacturers because of greater efficiency and less space required by the use of transistors. The gaseous electronics laboratory studies the electrical properties of ionized gases and their wide applicability in engineering and in particular microwave engineering.

Also under the title of Electrical Engineering research is the Bioacoustics Laboratory. This laboratory is concerned with research, through the use of intense high frequency sound, on the properties and functions of biological systems. A new method, which utilizes the ultrasonic technique, has been developed to produce changes in the brain tissue. Over 300 cats and monkeys have been used in these studies. This new method constitutes a powerful potential procedure for neurosurgery on humans. It is expected that many patients having conditions heretofore considered impossible to operate upon will be treated by this method. The new ultrasonic instruments now in routine use in this laboratory represent the first precision equipment of this nature anywhere.

Many phases of research on the campus are under government contracts. The largest research contract at the University is that under which the Control Systems Laboratory works. This laboratory has about 125 employees doing research for the government in the general fields of Electrical Engineering and Physics. The work of the CSL is classified for security reasons. Because of this, most of the students know little more about CSL other than the revolving radar antenna on top of the laboratory produces an intermittent blip on their house radios.

Another area of research is that of the Chemical Engineering department. Nearly every one of the staff is doing some phase of research. An interview with Dr. J. W. Westwater revealed his interest in research. He pointed out that some of the most familiar phenomena in nature are among the least understood. He has done extensive research on the boiling of liquids, which is currently of lively practical interest due to the necessity of cooling nuclear reactors and jet aircraft engines. Boiling liquids are used as coolants because of the rapid rate at which a liquid can absorb heat. The problem arises when the temperature difference between the liquid and the metal being cooled reaches a critical value and the amount of heat transferred to the liquid decreases radically with a subsequent overheating of

the metal. Dr. Westwater found, in a series of photographs taken at one-millionth of a second, that this decreases in heat transfer is due to a blanket of vapor that forms between the metal and liquid, thereby effectively insulating the metal. This effect is produced when a drop of water has fallen on a hot stove. The drop rolls about noisily, but evaporates slowly. A drop on a moderately warm stove boils readily and evaporates much more rapidly.

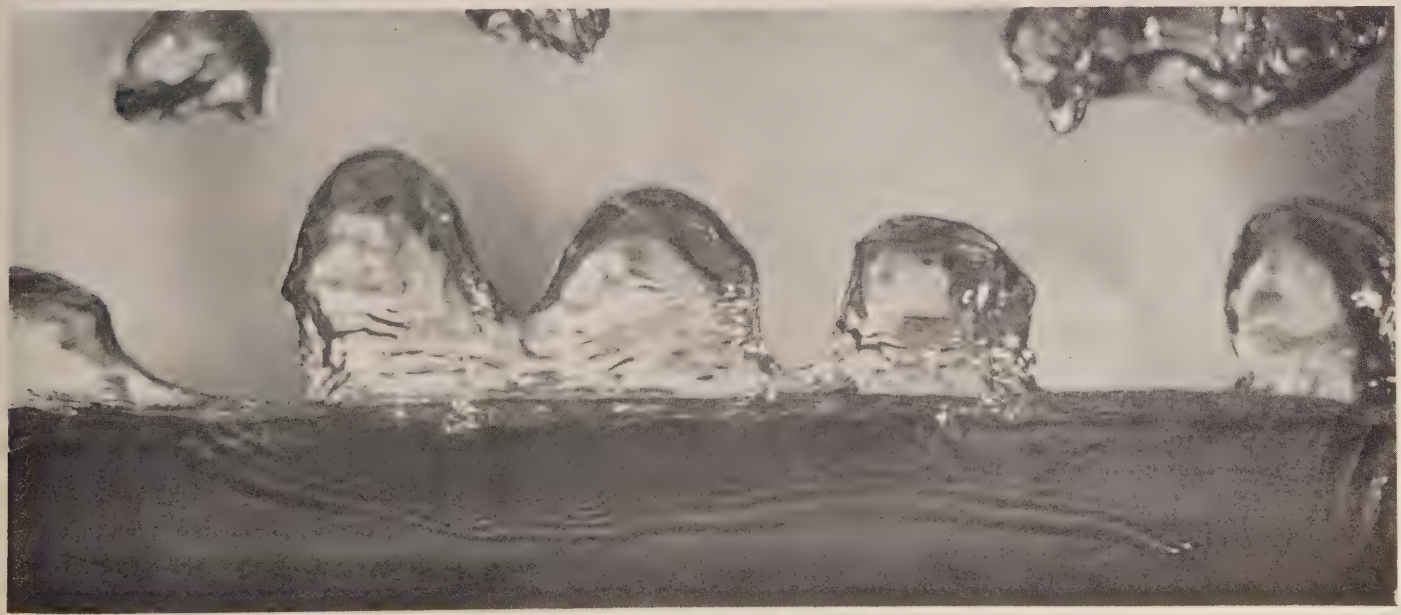
The work done by Dr. Westwater is just one of the many research projects being conducted in the Chemical Engineering department. In turn, the Chemical Engineering department is just one of the many University departments that carry extensive research programs.

The Aeronautical Engineering department utilizes a shock tube for studying the effect of high air pressures and wind velocities on different surfaces. Most of the analysis is done by high speed photographs which show the level of air pressure and the location of shock areas near the surface.

The research program in Structural Engineering at the University is quite extensive. The academic staff includes 17 full-time members of rank ranging from research associate to professor, and about 40 to 45 half-time graduate students. The major part of the work is supported by grants or cooperative research contracts with federal and state agencies or industrial organizations. The programs cover a wide range of subjects but are primarily related to the strength and behavior of structural components under static, fatigue, or dynamic forces.

Arthur Newell Talbot Laboratory,

(Above) The Talbot Laboratory testing machine fractures a specimen of concrete.
(Below) This photo taken at 1-millionth of a second, shows the blanket of vapor surrounding a very hot metal thereby insulating the liquid from it. The liquid is then prevented from cooling the metal by cooling.



3 BIG STEPS

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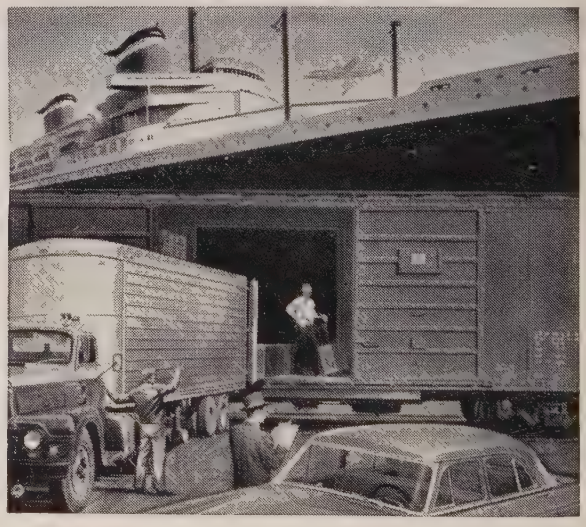
which houses most of the structural work often resounds with the crushing of a concrete block or the failure of a steel plate in tension on Talbot Lab's giant 3-million pound testing machine. The structural engineers use this and smaller testing machines to gain a better knowledge of the behavior of structures. This knowledge leads to the more economical and efficient design of engineering structures.

The noteworthy achievements of the different research programs being carried out by the University of Illinois give its engineering students and faculty a great deal of pride. However achievement for achievement's sake alone would not justify the work done. The sponsors of the different research projects have something more than that in mind. A bulletin describing the research program of the structural engineers put out in May, 1955, sums it up this way.

"Contact with and experience in research is perhaps the most valuable part of a man's training to be an engineer. Education in the class room and practical experience are important, but participation in creative effort and in the investigation of basic problems enable one to go beyond the limitations of present practices and thereby contribute to the progress of the profession."

INDUSTRIES THAT MAKE AMERICA GREAT

TRANSPORTATION... FREEDOM'S GIANT



We sometimes become so bemused with its astronomical facts and figures that we are apt to regard the transportation industry as an end in itself.

But transportation has grown into a giant because it represents the translation into reality of some basic precepts of democracy . . . freedom to think, freedom to buy and sell, freedom to move about as we please. The resultant interchange of ideas, people and goods has inevitably led to the development of large-scale, efficient transportation. It is thus no accident that history's greatest democracy should also have history's greatest transportation system to serve it.

The transportation industry itself has never lost sight of its basic origins. Cognizant of its responsibility to the nation, it has always reinvested large amounts of its earnings in plant expansion, in engineering, in research—all for the development of better and more efficient methods, machines and conveyances. That is why American cars, planes, ships and trains are able to supply their services so efficiently and abundantly.

The science of steam generation for power, processing and heating in the transportation industry has likewise kept pace with the demand for greater efficiency. B&W, whose boiler designs power such giant vessels as the *S. S. United States,* continues to invest large amounts of its own earnings in research and engineering to discover better ways to generate steam for ships and trains, for power plants and factories. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

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SCIENCE AND ENGINEERING

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Dr. Richard R. Carhart, Carl D. Lindberg Reliability Staff Dept. Engineer, and Dr. O. B. Moan evaluate the functional and operational reliability effects of proposed revisions in the electrical power supply of a missile.

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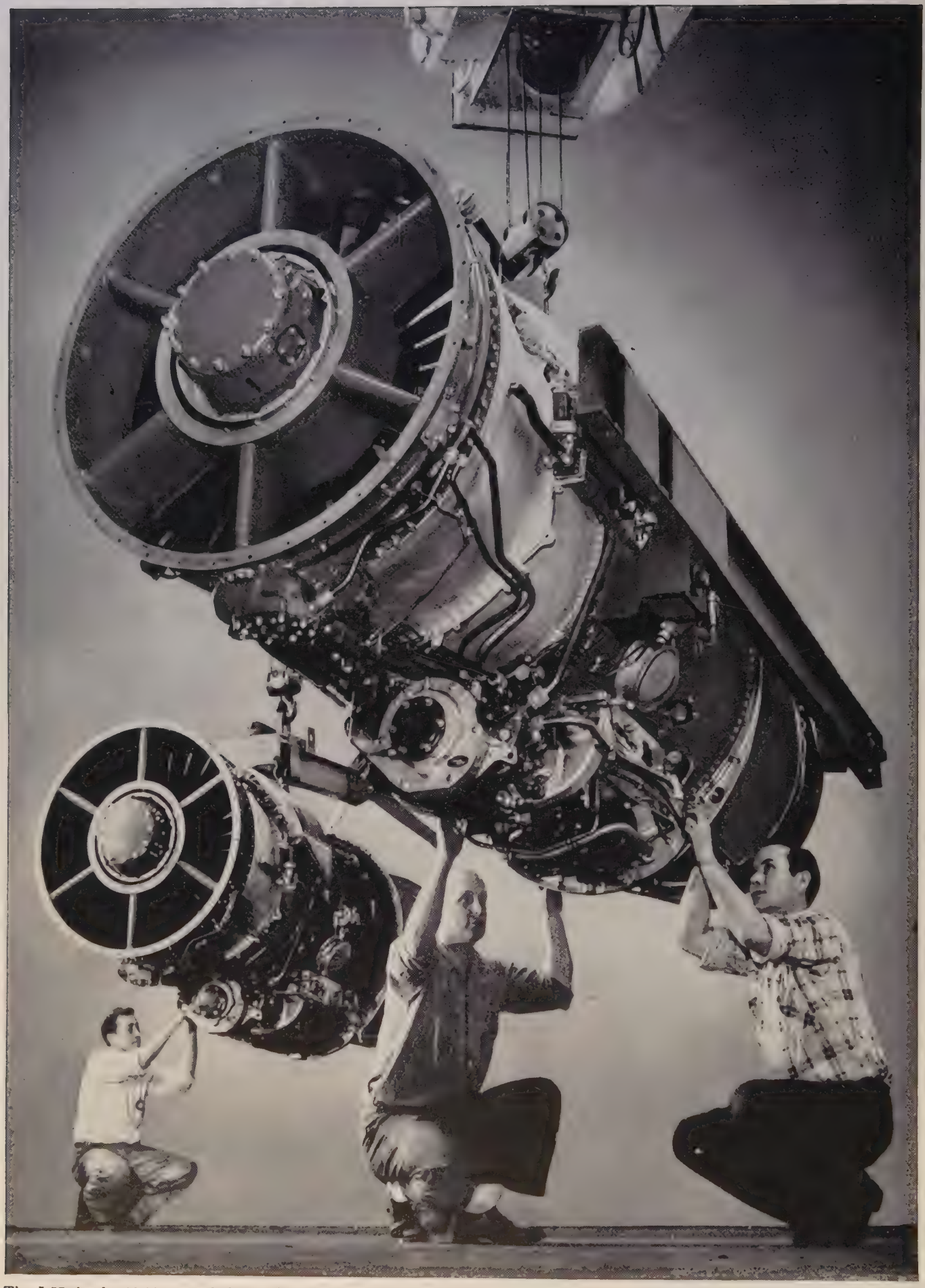
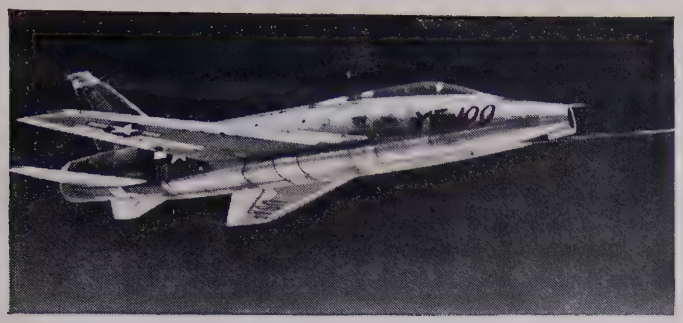
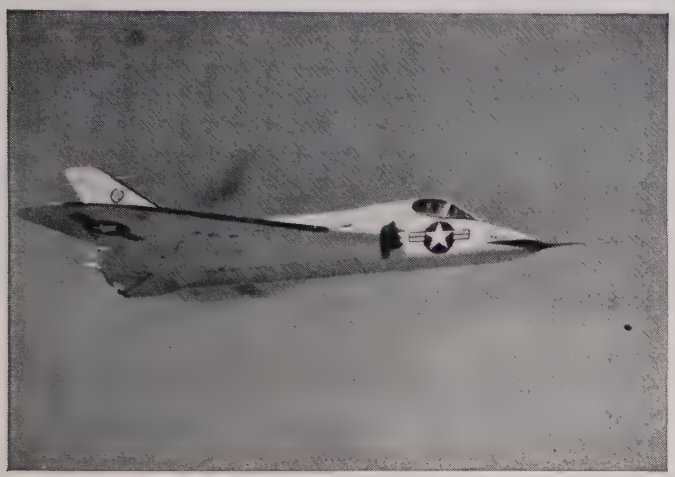


The J-57, in the 10,000-pound thrust class, is the most powerful turbojet engine now in production. A new generation of U.S. air power has been designed around this mighty new Pratt & Whitney Aircraft engine.



North American's F-100 Super Sabre, fastest Air Force jet fighter, is powered by Pratt & Whitney Aircraft's J-57 engine.

First all-jet heavy U. S. Air Force bombers are the huge Boeing B-52s, powered by eight J-57s mounted in pairs.



The Douglas F4D Skyray, fastest Navy jet fighter, will be powered with the big J-57 engine.

The Douglas A3D, the Navy's most powerful carrier-based attack airplane, has two J-57 engines.

Blazing the Way for a New Generation of Air Power

The most powerful turbojet engine in production is blazing the way for a whole new generation of American aircraft.

That engine is Pratt & Whitney Aircraft's J-57, the first turbojet to achieve an official rating in the 10,000-pound thrust class.

But the J-57 provides far more than extreme high thrust. Its unique Pratt & Whitney Aircraft design, achieved after years of intensive research and engineering, offers as well the low specific fuel consumption so vital to jet-powered bombers and future transports, plus the additional important factor of fast acceleration.

The importance of the J-57 in America's air power program is clearly shown by the fact that it is the power plant for three of the new "century series" fighters for the U. S. Air Force—North American's F-100, McDonnell's F-101 and Convair's F-102—as well as Boeing's B-52 heavy bomber. The Navy, too, has chosen the J-57 for its most powerful attack aircraft, the Douglas A3D, the Douglas F4D fighter and for the Chance Vought F8U day fighter. And the J-57 will power the Boeing 707 jet transport.

The J-57 is fully justifying the long years and intensive effort required for its development, providing pace-setting performance for a new generation of American aircraft.

Engineering graduates who can see the challenge in this new generation, might well consider a career with the world's foremost designer and builder of aircraft engines.

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How Sweetly Flows the . . .

BONEYARD

by Jim Piechocki, Aero E. '56

The task of adequately defining and describing the Boneyard is one which can never be accomplished. The Boneyard is indefinable and beyond description. The words and phrases of the mere mortals who frequent North Campus (oft times referred to in hushed tones as "engineering campus) are feeble efforts when one begins to consider the deep and profound significance of this noble institution north of Green Street. Passers-by who refer to it as a *dirty creek* are to be reprimanded for their lack of verbal fluidity and their all-around lack of insight and appreciation of the finer things of life. Those who call it a *sewage stream* are to be slighted. And those who refer to it in even less reverent tones should be packed in a crate and shipped back to Differential Calculus.

Superficially, the Boneyard is a stream, but its real significance lies deep beneath its bottle-strewn surface. That is to say, the Boneyard is a symbol. The difficult part of this matter of definition comes to light when some inconsiderate whelp asks, "A symbol of what?" This question can best be answered by handling the problem in a scientific and engineering-like manner and taking up the discussion after a short coffee break. Now for the history.

Very little is known concerning the origin of the Boneyard, and what little data that has been gathered has been absconded with great difficulty. Vague shapes in slouch hats flee in terror upon being questioned about the early history of the Boneyard. Earliest mention of it was discovered in the ancient mystic poem, *Calculus Integratus* by Anonymous (meaning poetic EE):

". . . to the sallow marrow of the bone,
Yard upon yard, and four to the bar."

A thorough examination of the early (i.e. before 10 a. m.) reports of the Board of Trustees shows no mention of the Boneyard. Looking through the early reports of the Comptroller, the diligent researcher will find no mention of it. Moreover, various members of the campus police force are not in agreement on its exact location. The Student Senate appears not to have directed any legislation in its behalf, and no evidence of any Boneyard Committees was detected under a listing of Union activities. A hasty perusal of the archives of the history of the College of Engineering revealed the mention of a "Boneyard Central Heating" utility, obviously a prehistoric attempt on the part of the mechanical engineering forefathers to harness the energy of the rushing waters. One old check stub found in the treasurer's files of the Student Branch of the Institute of the Aeronautical Sciences mentions: CIDER AND DONUTS 75c EMPTIES GO TO BONEYARD SEE JOE. Engineering students are traditionally proud to be associated with it, and wanderers in the vicinity of South campus are

The heavy storms of October 6, 1955 caused the Boneyard to rise out of its banks and inundate Burrill Avenue near Civil Engineering Hall.

In its more peaceful moments, the Boneyard presents this more bucolic scene of pastoral peace and civilzed cracker-jack boxes.

ignorant of its existence. That fixes things as far as the history is concerned, and we can conclude from the above data that the Boneyard has always been and will flow on forever. So there!

Every good, solid, yankee-doodle-acey-ducey, ipsy-pipsy-no. 1 analytical function possesses directivity of a semi-definite nature, and the Boneyard is no exception. It would be well to discuss this phase at this point. The Boneyard slithers down from the west and slashes through the heart of engineering campus. On rainy days it literally roars behind the electrical engineering building, frabjously frollicking past thousands of lurking condensers and leering voltmeters, drowning out the din of myriads of churning alternators. On sunny days it trickles past Civil Engineering Hall and blends with the harmony of swishing slide rules and pencil scratchings. Burbling under the bridge at Matthews Street, it glides smoothly between the Transportation and Mechanical Engineering buildings (making direct walking between the two bully fun). Beyond this few know or care to tell just where it goes.

There appears to be no formally published reports on the chemical composition of the Boneyard. For the most part, it is as green as the clover in McShanahan's north forty. It's odor can best be described as that which would emanate from hydrogen-sulfide-saturated sauerkraut (fresh). A recent qualitative analysis revealed the presence of rocks, beverage cans, homecoming programs, large amoeba, broken centigrade thermometers, one manometer bank, and a goodly quantity of objects resembling text books. This analysis unearthed no trace of engineers' tears or bones, seemingly shattering an old belief prevalent in non-engineering quarters. At a recent Engineering Open House, a display was set up whereby the waters of the Boneyard were to be filtered for drinking by passing guests. Intensive research into the reports of passing guests have shed no light on the outcome of the venture.

The Boneyard, it is well known, has a distinct personality. There are times when it is as meek and gentle as a freshman, and on various occasions it can be as violent as turbulent flow in a wrinkled tube. A recent example of the Boneyard's wrath was displayed on October 6, 1955, when it erupted in a fantastic deluge over the Matthews Street bridge and threatened the very existence of the first floor of the Transportation Building. Newspapers naturally attributed the flood to a severe rainstorm that happened to occur simultaneously with the flood, but observers acquainted with the profound significance of things sacred know better.

England has her Thames, and the Nile flows majestically in Egypt. The beautiful blue Danube inspired the writing of a great waltz, and South Campus has its duck pond (or whatever it is). But the greater pride hath no man than the engineer at the University of Illinois who speaketh, "How sweetly flows the Boneyard."

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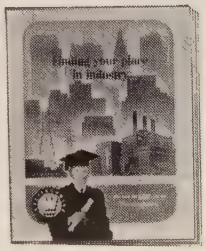

Engineering Societies

by David Webster, F. A. A. '56

No matter what branch of engineering you are in, there is connected with it a student society which in turn is connected with a national engineering society. Belonging to one of these societies is a definite advantage, because it lets you get together with the other students in your option and lets you see what they are doing.

Every society holds at least one meeting a month, generally in the evening. Besides a business meeting there is generally a guest speaker at each meeting. For the most part these speakers are from industry. In this way, the members of the respective society learn, first hand, about the various new products, processes, and problems. Also, afterward, refreshments are often served, and this gives the student members a chance to sit down and talk with the speaker, and learn, first hand, what it will be like when he (or she) starts working in his chosen field.

For instance, during the past semester, the mechanical engineering society heard lectures on the design problems of glass ware, and the part mechanical engineers played in it.

The combination society of the electrical engineering department heard a panel of five industrialists discuss what industry expects of the engineer. Also, in cooperation with the music department, they had a very good lecture on Hi-Fi.

Aeronautical Engineering

Besides the regular meetings IAS (Institute of the Aeronautical Sciences) sponsors an annual paper competition, where the student may gain experience in writing technical papers.

There is also the Rocket Society, which boasts members from almost every engineering option. (For more information on the Rocket Society, see the article on page 23 of the January 1956 Technograph.)

Architectural Engineering

Students in either option of the school of architecture may join the student branch of the American Institute of Architects. The AIA sponsors an annual design competition whereby the student can win recognition for his abilities.

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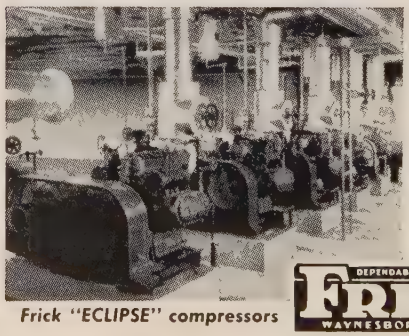

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Ceramic Engineering

Members of SBACS (Student Branch of the American Ceramic Society) have the additional advantage of competing in the annual speaking contest. The speeches are on subjects pertinent to the field, and the winners compete in the national contest.

Chemical Engineering

The American Society of Chemical Engineers (ASChE), in addition to their regular meetings, takes part in the national design competition sponsored by the parent organization. Members may also enter the regional paper competition.

Civil Engineering

Besides attending regular meetings, members of the American Society of Civil Engineers (ASCE) may attend the regional conferences, and thereby broaden their outlook and acquaintances.

Electrical Engineering

The AIEE-IRE is actually a combination of two societies, the American Institute of Electrical Engineers, and the Institute of Radio Engineers. Some of the activities of the members include participation in the annual paper competition, a banquet, and a picnic.

Mechanical Engineering

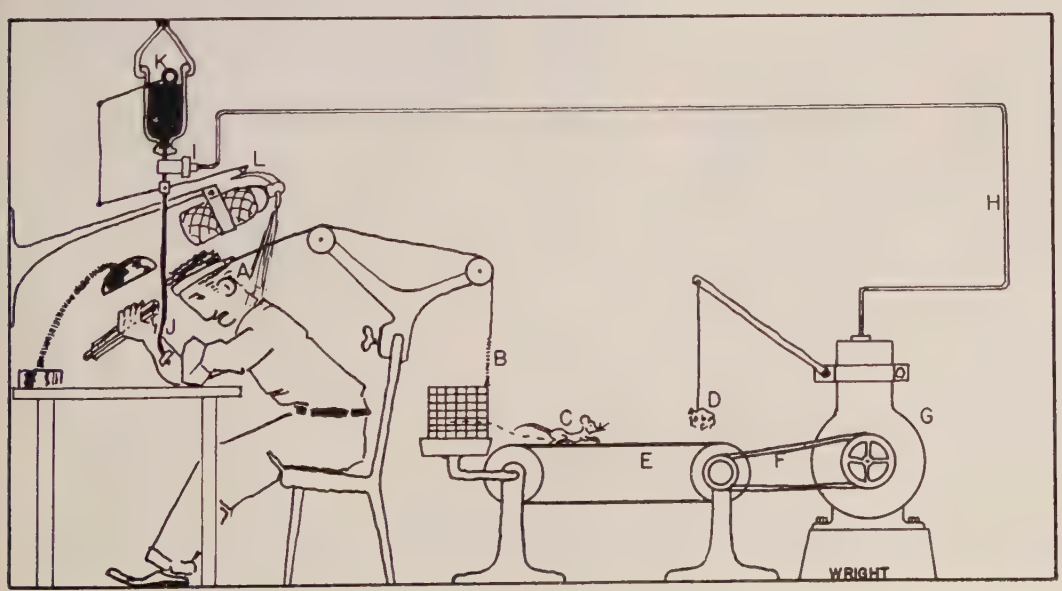
The American Society of Mechanical Engineers also sponsor a paper competition. Members also keep abreast of new developments via the society's monthly journal.

Mining & Metalurgical Engineering

This semester the Mineral Industries Society has had speakers from industry, and also faculty members. Also included in every meeting is a social period where the students are given a chance to meet their instructors informally, and to get to know them better.

There are many more societies than I have mentioned here, so if you don't see one directly connected with your option, look around. I am sure you can find a society to suit your needs.

YEP, YOU CAN TELL AN AREO ENGINEER A MILE AWAY
HEY! NOT YET....
WIND TUNNEL #1
I'VE REDESIGNED THE SHIP'S AERODYNAMICS WITH HIGH LIFT SURFACES TO COUNTERACT THE TRIM AND STABILITY DIFFICULTIES I'VE ALSO MINIMIZED FLAP DRAG WITH FOWLER FLAPS AND INTRODUCED LATERAL CONTROL DEVICES FOR USE WITH FULL SPAN FLAPS — THE ONLY THING WRONG IS THAT IT DOESN'T FLY!



THE CRAMMER

ENGINEER STUDYING LATE GETS SLEEPY & HEAD "A" DROPS PULLING CORD & RAISING DOOR "B". THIS RELEASES MOUSE "C" WHICH RUNS TOWARD CHEESE "D." TREADMILL "E" BEGINS TO ROTATE, TURNING BELT "F" & OPERATING HYDRALIC PUMP "G." HYDRALIC FLUID IN LINE "H" OPENS SWITCH "I" THAT LETS BLACK COFFEE FLOW INTERVEINIOUSLY "J." AS COFFEE IS DRAINED OFF, FLOAT LOWERS "K" CAUSING LINKAGE TO DEPRESS HANDLE "L" OF THE SELTZER WATER BOTTLE.

IDEA BY JAY MC ALISTER

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Airplane Division
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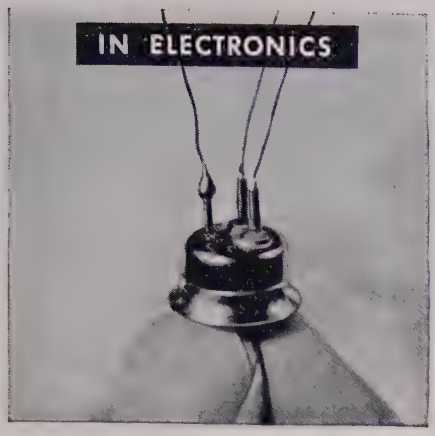

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THE opportunities for engineers in the automatic control field are as varied as today's world—and as intriguing.

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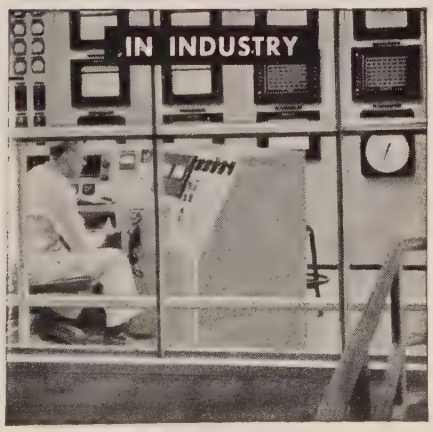
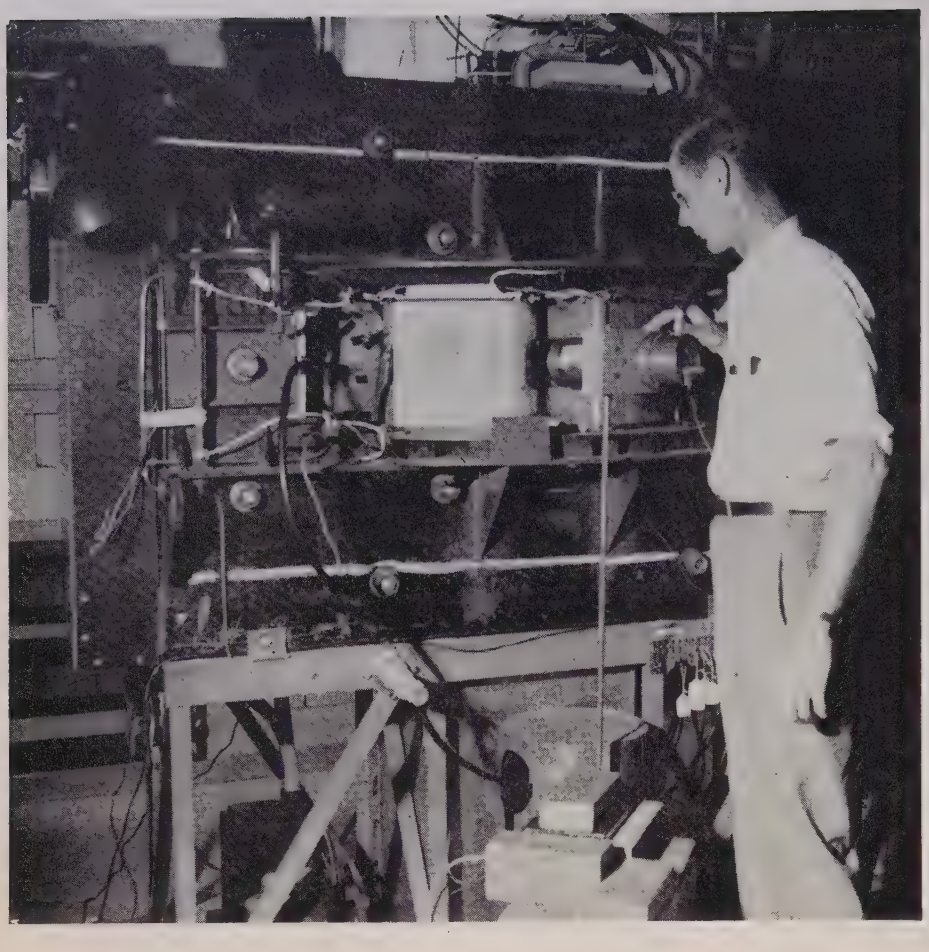




Professor Donald W. Kerst stands in front of one of his early betatrons which is capable of 8 million electron volts (M.E.V.).

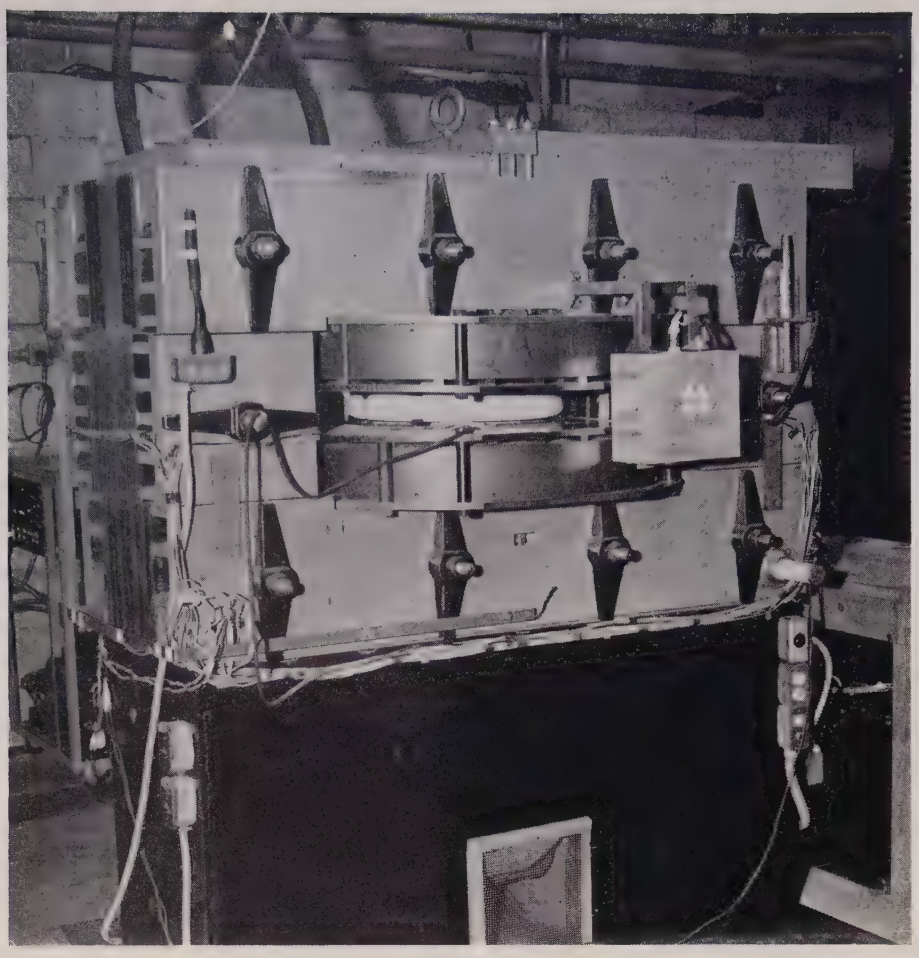
Universi

BETA

Dr. C. S. Robinson atop the reversing switch of the giant 300 M.E.V. betatron. Scale of the machine can be conceived when it is realized that this is just one section of the betatron.

Illinois

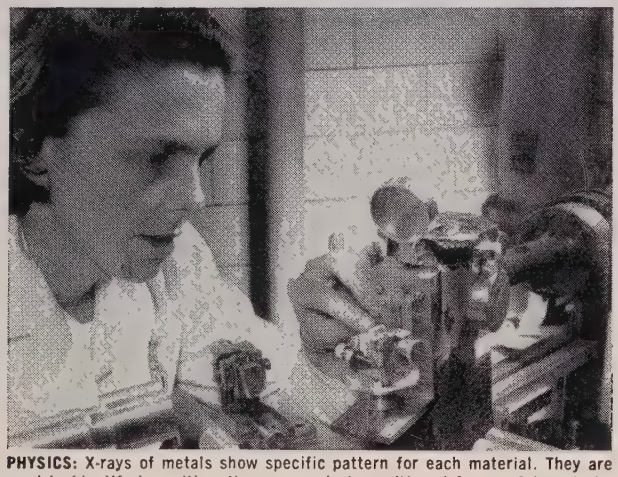
RON



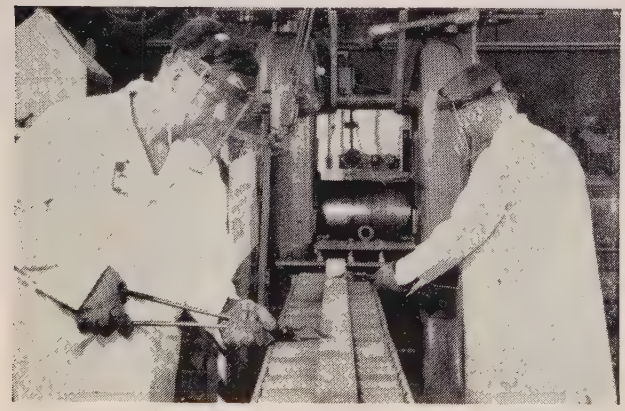
A 22 M.E.V. model betatron which was used for valuable nuclear research during the war years.

Dr. D. W. Kerst stands beside the original magnetic inductor accelerator, or betatron. This small machine was capable of accelerating electrons to energies of 2 million electron-volts! Compare it with the two story 300 M.E.V. betatron in the background.

CHEMISTRY: Radioactive tracers determine effectiveness of solvent extraction in purification of germanium tetrachloride... later processed into metal.



PHYSICS: X-rays of metals show specific pattern for each material. They are used to identify impurities. Here a sample is positioned for careful analysis..



METALLURGY: Rolling uranium strip for fabrication into fuel elements. Strip will be cut to length and further processed before going to reactive coolant.

Sylvania also has attractive openings with similar opportunities for:

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What do CHEMISTS PHYSICISTS and METALLURGISTS do at SYLVANIA?

Sylvania is one of the important names in electronics, America's dynamic $10 billion-plus industry. Where do physicists, chemists and metallurgists fit in? Let's look at the record:

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IN PHYSICS: Physical optics, electroluminescence, mass spectroscopy, electron emission phenomena;

IN METALLURGY: Powder metallurgy and the investigation of pure metals and semi-conductors.

From research such as this have come Sylvania's stacked ceramic tube, the pill-sized germanium transistor, traveling wave tubes, panelescent lighting, atomic reactor fuel elements, advanced weapons systems, and others.

Many Sylvania developments are still unreleased. The public hears of them tomorrow... the Sylvania team developed them yesterday.

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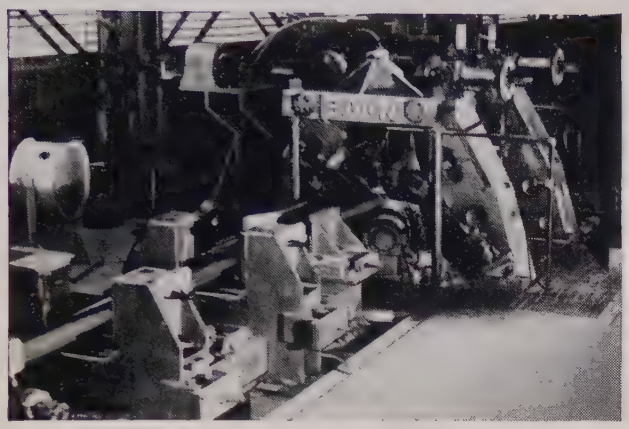
Another page for **YOUR BEARING NOTEBOOK**

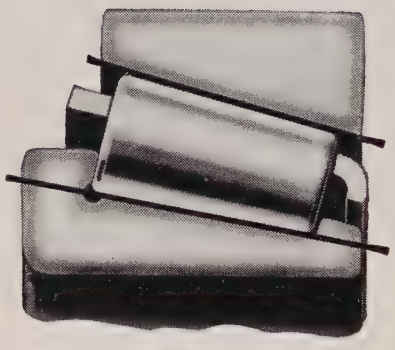
How to make a tube straightener true



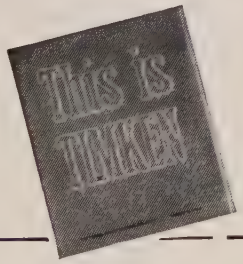
The engineers who designed this tube straightener were faced with the problem of building a machine that could withstand the constant stresses of handling 16½″ O.D. tubes of standard thickness and yet provide the necessary precision. Their answer was to mount the two driven rolls and the five idler rolls on Timken® tapered roller bearings. Timken bearings take both radial and thrust loads in any combination and have the extra load-carrying capacity to keep the rolls in rigid alignment.

Why TIMKEN® bearings have high load capacity

This cross-section of a Timken tapered roller bearing shows one reason why Timken bearings stand up under heavy load conditions. There is full line contact between the rollers and races. It's this full line contact that distributes the load over a wider area, giving Timken bearings their extra load-carrying capacity.



Want to learn more about bearings or job opportunities?



Many of the engineering problems you'll face after graduation will involve bearing applications. For help in learning more about bearings, write for the 270-page General Information Manual on Timken Bearings. And for information about the excellent job opportunities at the Timken Company write for a copy of "This Is Timken". The Timken Roller Bearing Company, Canton 6, O.

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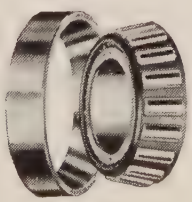
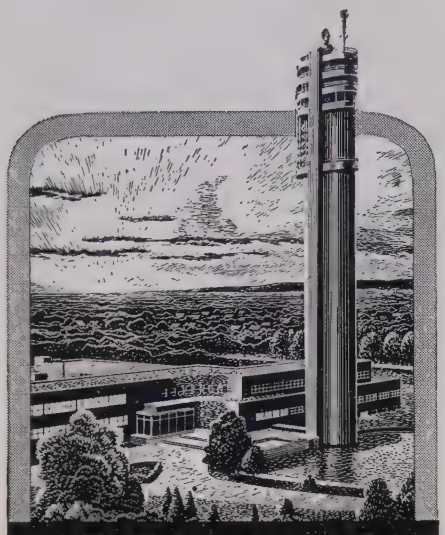


NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ⊕ AND THRUST →⊙← LOADS OR ANY COMBINATION ✳



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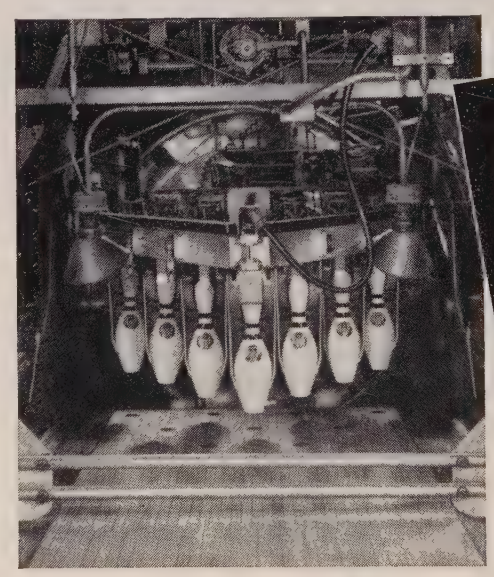
Technocutie for February—

Our Technocutie for February is an eighteen year old miss from Carmi, Rosanne Allen. On campus, Rosanne resides at the 4-H house. She is in the College of Fine and Applied Arts, majoring in advertising. In that conjunction, Rosanne is on the advertising staff of The Daily Illini. Last year she was an Illio beauty and this year she holds the title of Miss Rural Electric Co-operative of Illinois. In her spare time, Rosanne enjoys art, music, and swimming. She has brown hair and brown eyes and she measures 36-25-36 around the right places. She stands 65.5 inches tall, tipping the scales at one and a quarter cwt. We forgot her phone number but it's in the book.

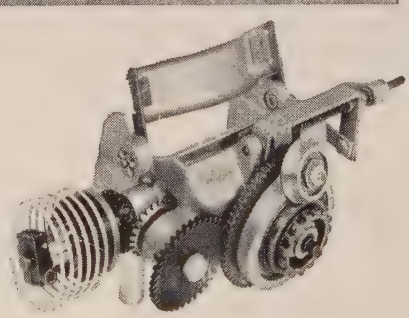
—Staff Photo



Automation comes to bowling

The automatic pinspotter, manufactured by the American Machinery & Foundry Company, incorporates Fafnir Ball Bearings at many of its turning points—40 in all. These bearings permit precise coordination of motion unhampered by friction.

Solving automation problems that involve the use of ball bearings is part of Fafnir's "stock-in-trade" . . . another example of the Fafnir "attitude and aptitude." The Fafnir Bearing Company, New Britain, Conn.



Section of Pin Distributor Drive Head Assembly equipped with six Fafnir Extra Small Series Double-Shielded Ball Bearings, including a duplex arrangement, plus a 200 Series Plya-Seal Bearing located in a housing within an Aircraft Type Bearing, plus another 200 Series Plya-Seal Bearing.

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BALL BEARINGS

NOTHING ROLLS LIKE A BALL

And so was born . . .

Ye Olde Universite

by Harry Hirsch, E. E. '57

"And so was born ye olde Universitie."

To our Open House guests, the University and its campus may have been the same last year as this year, 100 years ago as this, or will be the same 100 years from now. But we olde grads on campus know better, we think. We have seen new buildings begun, constructed and completed. The new Law Building, additions to the Men's Residence Halls and Lincoln Avenue Residence Halls for women (LAR to old hands) are old stuff to us.

Yet the University didn't spring up at once as construction style testifies. Anybody with eyes can tell the difference between the styles of Altgeld Hall, Civil Engineering Hall and the more recent Gregory Hall and the Library. A third group of architectural types exists in the newer buildings such as the Electrical Engineering and Mechanical Engineering Buildings and the Law Building. So, one may see that the campus history stretches back quite a few years.

As a matter of fact, the University opened in 1868, as the Illinois Industrial University. In the beginning there was one building, 10 faculty members and 77 students.

The two top stories of the building were used as a student dormitory. For those who complain about housing conditions today, there is some comfort gained in the fact that students had to provide their own beds, bedding and stoves. Coal was sold to the students at cost by the University. Yet there was some light to this cloudy scene. Rent was four dollars per semester.

In projects similar to those found in fraternities today, students spent two hours a day beautifying their building which for some obscure Victorian reason was called the "Elephant." They built a driveway, began the boardwalk, landscaped the surrounding area, made class room furniture and fences to keep out the livestock used in agriculture classes. Under the Land Grant Act of 1862, the University provided studies in agriculture, mechanical arts and military training without "excluding other scientific and classic studies."

The first president, or regent as he was called, John Milton Gregory, started a long line of University versus the public or alumni or state government or what-have-you, when he instituted courses in literature and languages. Many wanted only courses of direct practical value. After much irritation and "needless opposition," Gregory resigned in 1880. He is buried today in a small plot between the Administration Building and Altgeld Hall. His epitaph reads: "If you seek his monument, look about you."

At this time, students wore uniforms somewhat like those of the cadets at West Point and paid a tuition of $15 per year. When the University had been in existence long enough for the formation of a senior class, the young dudes began setting the pace sartorically for future Illini. Their symbol was a plug hat and their aptitudes included skills in taffy-pulls, chapel orations, shooting toothpicks during recitations and the ability to grow "burnsides and luxuriant mustaches." Remember this was in 1870. By 1880, enrollment was "322 Gentlemen and 112 Ladies." The faculty included 27 men and 3 women. Statisticians may calculate the percentile increase since 1868.

There were 15 buildings under the auspices of four colleges: Agriculture, Engineering, Natural Science, Literature and Sciences. One of the buildings constructed in 1878, Harker Hall was the Chemistry Building. It stands today, in the shadow of the Illini Union.

After the resignation of Regent Gregory, engineers on campus showed how adept they were in administrative fields when Selim Hobart Peabody, professor of mechanical engineering, was appointed regent. His appointment came during a depression. Faculty members salaries were $2,000 a year. Tuition was raised to $22.50. During the 11 years of Peabody's regime, only one new building was constructed. In 1885, the Illinois Industrial University became the University of Illinois.

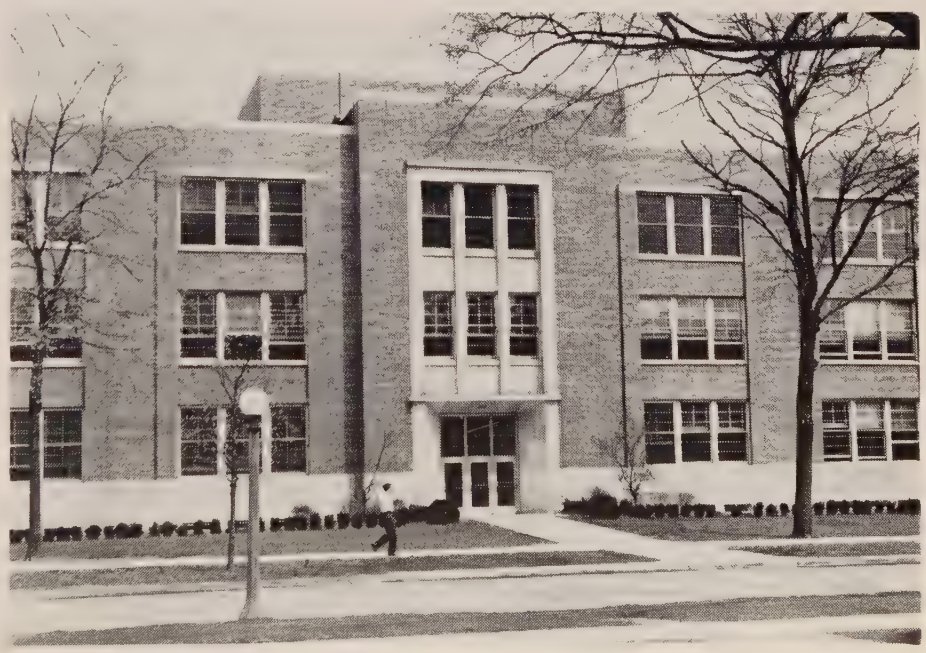
This was a stormy period marked by frequent battles between the regent and the alumni. The alumni succeeding in one fight as they succeeded in getting the Board of Trustees elected by popular election. Peabody said "popular election means political embroilment." True, true.

Student-administration troubles grew as Peabody banned fraternities and made chapel attendance compulsory. The chapel Bible was glued shut by students, much to Peabody's embarrassment when he attempted to open it. More than a dozen students faced suspension in 1891 when Peabody resigned.

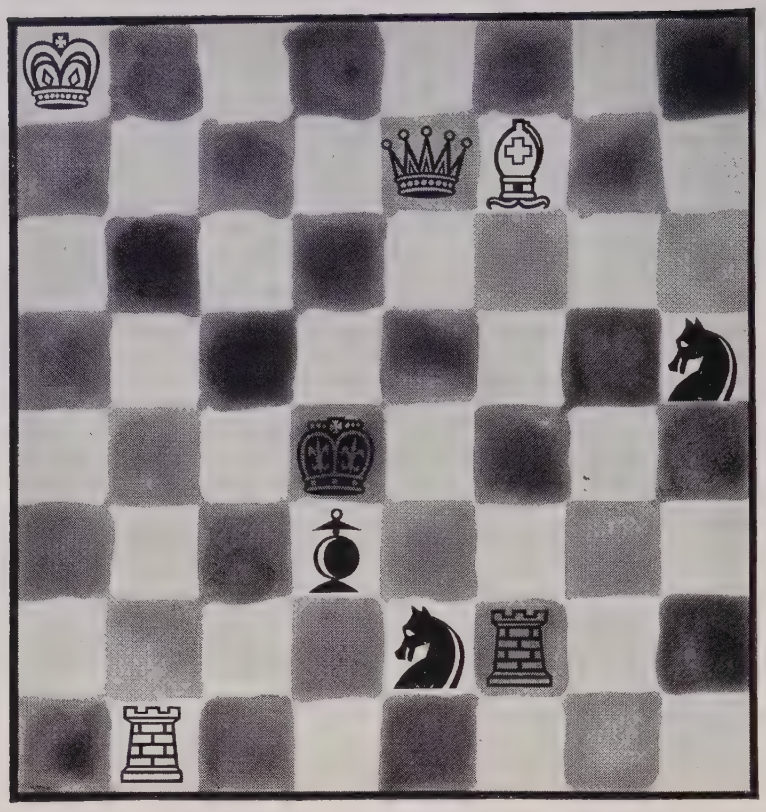
Our proud magazine was first introduced in the gay 90's along with the Illio.

During this period, "the flapper age," the "Golden 20's" the coonskin coats, old wrecks of cars, wild snake dances and extensive fraternity and sorority life ruled the campus. With the depression came a change.

From 1891 till 1894, Thomas J. Burrill, professor of botany, was acting re-



One of the more recent additions to engineering campus is th Mechanical Engineering Building which stands at Mathews and Green Streets.



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gent. Burrill acceeded to student demands by lifting the ban against fraternity ties and declaring military drill no longer compulsory for juniors and seniors. (Cheer up frosh and sophs, your day may yet come.) Burrill organized the graduate school in 1893 as well as the Summer School and University Extension programs. When Burrill left in 1893, the University boasted of 810 students. Natural History Hall had the most modern equipment of the day. The new Engineering Hall (Civil Engineering Hall) was filled to capacity. As a result of increased student interest in athletics (diverted from their regent ragging) songs, cheers and cheerleaders were organized for the first time on any campus. Orange and blue were recognized as the University's colors.

Andrew Sloan Draper first bore the title of President, serving from 1894 to 1904. The Chicago Professional Schools were organized as well as the Law School and State Library School.

By 1904, enrollment had passed that of Wisconsin and Michigan, both older institutions, reaching 3,459 students and 351 faculty members. Enrollment in the College of Engineering was the largest of any of the colleges (ahem). Test cars for the Illinois Central and Big Four railroads were built on campus. Industry brought its technical problems to the University engineering faculty. Electrical Engineering became a separate department with 40 courses in 1898 in the new Electrical Engineering Building (now Electrical Engineering Research Lab.)

Construction included Lincoln Hall, Bevier Hall, the much added-to Davenport Hall for agriculture courses, Altgeld Hall, and the fund-shy Auditorium, whose bad acoustics have become a campus tradition. Attempts to rename that Nile of the engineering campus, the Boneyard, into Silver Creek were laughed into oblivion.

Edmund James was president from 1904 to 1920. During his regime, the University flowered on a grand scale with students, faculty members and speakers from all over the academic world. During this time, the present Chicago Professional School site on Chicago's West Side was acquired on the site of the Chicago Cubs' old ball park. Enrollment increased to 9,249. The Armory was built in 1914 with an unimpeded space of 200 by 400 feet. Illini Hall was built as a YMCA in 1908. Both were used to house cadets prior to and during World War I.

This was the beginning of the era of Bob Zuppke, famous Illini football coach. "Hail to the Orange" and the Loyalty Song were composed during this time. Homecoming began in 1910. Illinois was a strange school where the football coach outlasted the presidents. From 1913 to 1941, five presidents served to one football coach, Zuppke. He said "Five presidents of the University served during my regime, and I have been proud of every one of them."

David Kinley, professor of economics and dean of the Graduate School was elected president in 1920. By 1921, Illinois was the third largest university in the nation with an enrollment of over 10,000. Smith Music Hall, McKinley Hospital and Memorial Stadium were erected. "Red" Grange helped dedicate the Stadium at Homecoming, 1924, with his fabulous victory against Michigan.

Harry Woodburn Chase, was president from 1930 to 1933. Under Chase, new student rules and regulations, to promote student self-government and social responsibility were formulated. They died in the depression faced by the economic facts of life. Students matured without the aid of regulations. Buildings constructed during this time included the Chemistry Annex, Women's Gym, Huff Gym and a new home for the president, replacing that on the present site of the Electrical Engineering Building. The second acting president in University history, was Arthur Hill Daniels, who served from 1933 to 1934. Federal public works funds were used by the University during this time for construction purposes.

Another engineer, Arthur Cutts Willard, head of the mechanical engineering department and acting dean of the College of Engineering, was president from 1934 to 1946. The Union Building was begun under a PWA grant in 1939 and completed in 1941. It stands on the site of old University Hall, one of the original buildings on campus. The first Men's Residence Hall was built in 1942. Gregory Hall, housing the School of Journalism and Communications and the School of Education was completed.

George Dinsmore Stoddard became president in 1946. With the war's end, the "temporary" branches at Navy Pier in Chicago, and Galesburg, were opened to take care of the vast influx of students. The Ice Skating Rink and Stadium halls were used for housing. The Electrical Engineering Building, Betatron, Chemistry East and LAR were built. Galesburg was closed in 1949, but Navy Pier's enrollment grew and with it grew the clamor for a permanent four-year state university in Chicago; a clamor which still exists. A controversy with the Board of Trustees led to Stoddard's resignation in 1953.

He was succeeded by Lloyd Morey, University comptroller since 1911. During his two year term, President Morey kept the building program going with the construction of the new Law Building and instituted studies into the expansion of Navy Pier branch.

This year, Morey was succeeded by David Dodds Henry, who proved his administrative ability at Wayne University and New York University. The enrollment today flirts with 25,000 and building and expansion plans forge ahead. This is the University of Illinois today.

The Electrical Engineering Building stands on the former site of the house of presidents of the University. It was opened before full power was turned on and Dean Everitt urged everyone to work in miner's helmets.

A FEW YEARS AGO, HE WAS ON CAMPUS AT PURDUE UNIVERSITY, AND NOW . . .

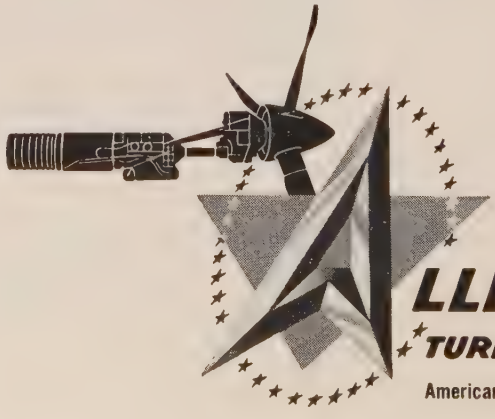
FLOYD D. (Doug) WALLACE, JR., above, is a senior project engineer at Allison.

He left Purdue in 1947 with his AE degree and came to Allison the same year. Presently, he is in charge of instrumentation and automatic process controls at Allison's new Research & Development test center.

With Allison now in the midst of a $75 million engineering expansion and building program, much of his time is spent in vendor contact work, studying and selecting equipment most adequate to do the job; observing, and helping with installation. He is shown above checking a control valve positioning amplifier on the instrument panel for controlling air pressures and temperatures of four electric motor-driven, axial flow compressors. This new facility is part of the new Research and Development test center, which—when completed—will enable testing of individual combustion components for turbo-prop and turbo-jet engines, compressor and turbine components.

Doug's work is "cut out" for him for some time to come, for only recently, Allison broke ground for the engineering building which is to be the center of expanded Research and Development facilities for advanced types of aircraft engines for commercial and military use.

With this long-range expansion program, Allison needs more engineering personnel, and opportunity for young graduate engineers is unlimited. Arrange now for an early interview with our representative on your campus, or write for information about the possibilities of YOUR engineering career at Allison: Personnel Dept., Engineering College Contact, Allison Division, General Motors Corporation, Indianapolis 6, Indiana.



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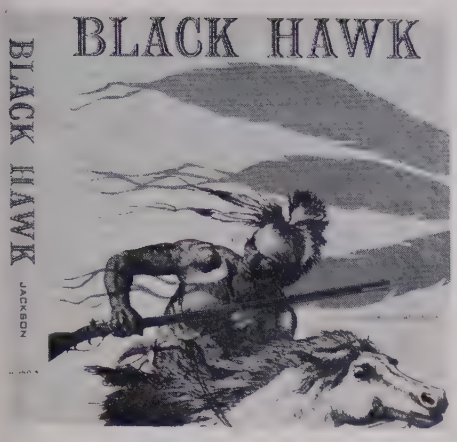


Book Review

by Paul E. LaViolette, D. S. S. '56

BLACK HAWK: An Autobiography
Edited by Donald Jackson
University of Illinois Press
260 Pages Illustrated $3.75

The coming of the white man brought many plagues to the Indians but the worst plague of all was the coming of the white man himself. A white settlement, the Indians used to say, was like a raccoon grease spot on a new blanket. Nothing at first, but a spot that would swiftly spread until it had covered all it touched. It was the realization of this inevitable outcome of white man contamination that touched off nearly every major Indian war and the Black Hawk War was fought for these same reasons.

It was not so much a war as an exodus, for most of the Nation of the Sauk followed Black Hawk back across the Mississippi. They came back to resettle and cultivate lands they claimed to have never given up. They came back as children trusting to the ways they had been brought up in, ways which the white men they had dealt with before, the traders and trappers, had followed. But the situation had changed and the people they dealt with now were settlers who wanted no fur but rather the very land they stood on. The words of Black Hawk reflect the bewilderment of his people at the hornets' next they had seemingly stirred up. Their march to their old burial grounds gave way to a dazed wandering and then to a full rout back toward the Mississippi. But President Jackson had given orders to stop any retreat across the Mississippi. A lesson was to be taught the children of the Great White Father—a bloody lesson. When the starved, obviously beaten band of men, women and children reached The Bad Axe River a gun boat sprayed grape shot until the river "was perceivably tinged with blood." Black Hawk gave himself up to save his people and the Sauk settled down on their government land to slowly disappear in a manner not as spectacular but just as efficient as the grape shot on the river.

The book is unusual in that it is an autobiography. Black Hawk tells his own story in a manner that, while somewhat stylized by his interpreters, makes the old warrior live again. Besides the war itself Black Hawk tells of his early years which gives valuable insight to reasons why he and his fellow Indians behaved as they did in their last war. The book is well footnoted and has an extensive introduction, epilogue and appendix that fully supplement Black Hawk's own words. Altogether a book well worth spending an evening with.

. . . and it is wonderful that even today with all competition of records, of radio, of television, of motion pictures, the book has kept its precious character. A book is somehow sacred. A dictator can kill and maim people, can sink to any kind of tyranny and only be hated, but when books are burned, the ultimate in tyranny has happened. This we cannot forgive. . . . People . . . automatically believe in books. This is strange but it is so. Messages come from behind the controlled and censored areas of the world and they do not ask for radios, for papers and pamphlets. They invariably ask for books. They believe books when they believe nothing else.

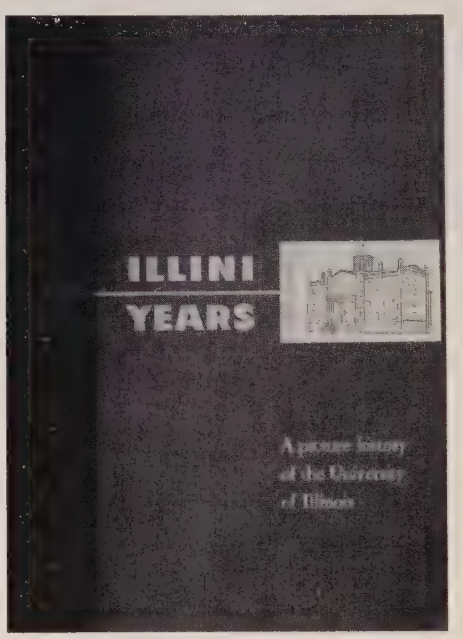
—John Steinbeck

ILLINI YEARS: A Picture History of the University of Illinois
University of Illinois Press
$1.50, 134 Pages

In 1868 the Illinois Industrial University opened its doors to 77 students and 10 staff members on a campus which consisted of one ungainly building in the middle of a cow pasture. Urbana had offered the $100,000 building and lands as part of the inducement to establish the University at Urbana. Later historians cite the oyster suppers, quail dinners and the plentiful champagne plied to the visiting legislators as more influencing than the bleak building and muddy pasture that had originally been planned for a local seminary.

The University's earliest years were its most hectic and the staunch policy of its first regent, John Milton Gregory ("Education must fit for society and citizenship as well as for science and industry,") saved the University from becoming a technical school despite strong pressure to the contrary.

The years that followed showed the steady rise of the University from its meager beginning to what it is today—one of the leading Universities in the world.



Illini Years, a re-issue by the University of Illinois press, depicts with more than 200 pictures the history of the University from its founding in 1868 until the middle of the reign of President Stoddard in 1950. Because of its dated terminus the original price of $3.50 has been changed and the re-issued copy sells for only $1.50. This does not change the history of the University of course, and except for the six year missing period the book remains as an outstanding portrayal of the story of the University.

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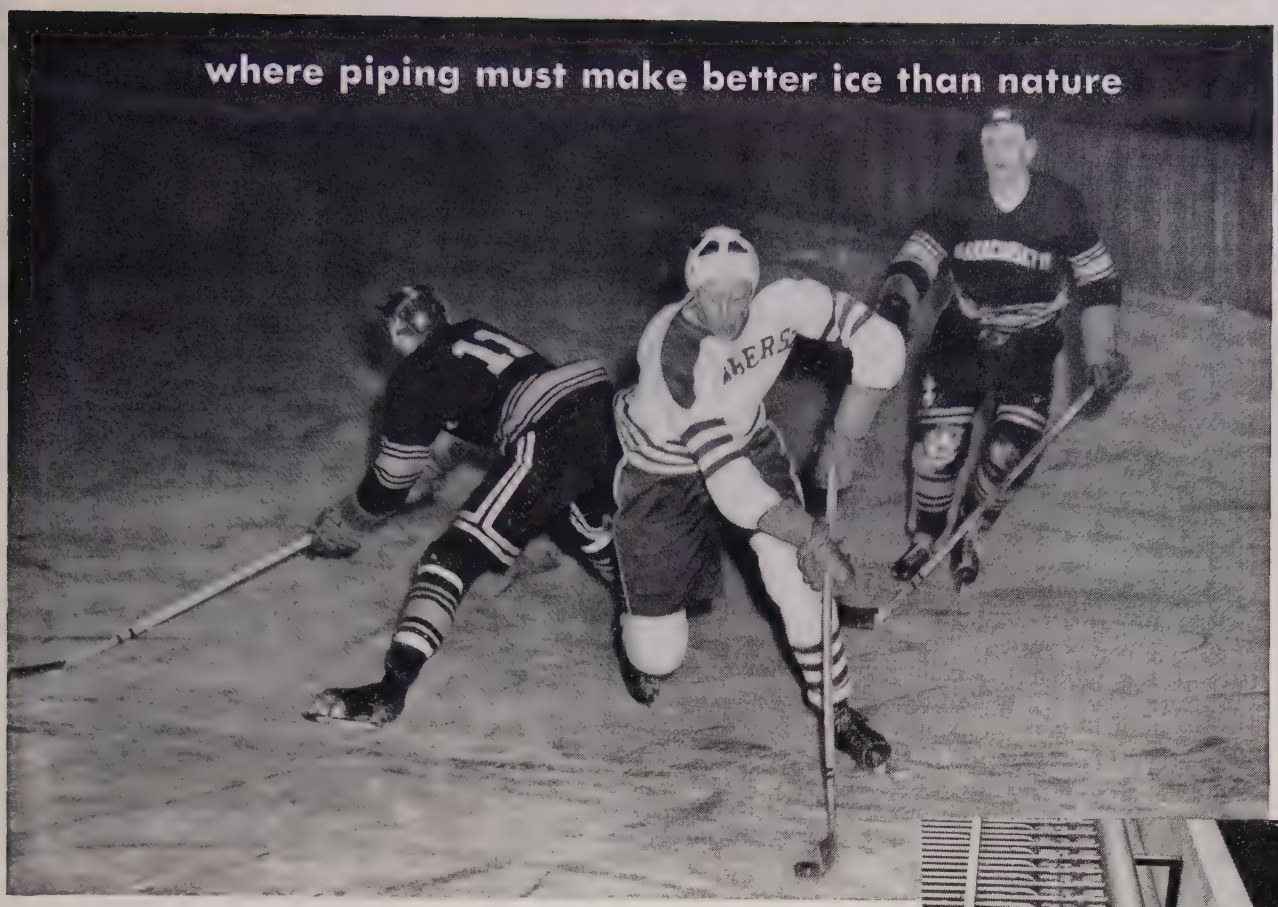


A dependable surface for the flashing speed of hockey at the Jarvis-built Amherst rink

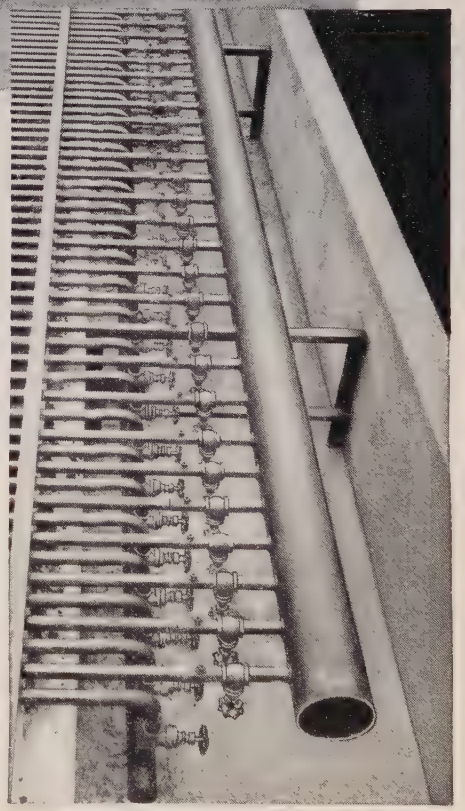
Rink builders rely on JENKINS VALVES

Modern skating rinks at sports arenas, colleges, schools, and clubs provide a hard, flawless surface on demand. Making better ice than nature requires critical valve control of hundreds of separate loops under the ice.

Arrested flow of the brine in even one loop could cause a dangerous "soft" channel across the surface. At any one of hundreds of critical points, faulty valve operation could easily shut down an entire rink.

Jarvis Engineering Co. of Boston, who built the Harvard, Amherst, St. Paul's, and many other fine rinks, have chosen Jenkins Valves for over 80 miles of piping involved. They know that the only true economy is to install the best valves that money can buy. Other rink specialists share their confidence in the demonstrated *extra measure* of efficiency and economy provided by Jenkins Valves, along with the leaders in every field of construction.

The Jenkins Diamond trade mark is their reliable guide to valve dependability, for all new installations, for all replacements. Jenkins Bros., 100 Park Ave., New York 17.



The JENKINS VALVES controlling each loop from the brine header in the St. Paul's School rink at Concord, N. H., are Fig. 1273 Bronze Gates with socket ends for silver brazing. These and other Jenkins Valves on lines to compressors, condensers, and pumps assure the critical control essential to efficient rink operation.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

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DIGITAL COMPUTER
TECHNIQUES

applied to the design, development and application of

AUTOMATIC RADAR DATA PROCESSING, TRANSMISSION AND CORRELATION IN LARGE GROUND NETWORKS

ENGINEERS
&
PHYSICISTS

Digital computers similar to the successful Hughes airborne fire control computers are being applied by the Ground Systems Department to the information processing and computing functions of large ground radar weapons control systems.

The application of digital and transistor techniques to the problems of large ground radar networks has created new positions at all levels in the Ground Systems Department. Engineers and physicists with experience in the fields listed, or with exceptional ability, are invited to consider joining us.

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Culver City, Los Angeles County, California

National Engineering Week

The week of Feb. 19 to 25 is being set aside by the engineering profession to celebrate National Engineers' Week as part of the continuing effort to make engineering more widely recognized as a profession. National Engineers' Week will be quite widely publicized this year by all levels of the Professional Engineers' Society through talks and programs on radio and television, through articles in the press, and through visual exhibits.

Anatole R. Gruehr, chairman of the National Engineers' Week committee states, "It is hardly necessary to describe the extent to which the future prosperity and the security of our country are dependent upon the engineering application of scientific discoveries to increased productivity and to military preparedness. It is also generally admitted that the creative role of the engineer as a designer, a developer or a production organizer is not well understood by the general public. Yet it is public opinion which, to a large extent influences the choice of our youth in the selection of their career. The essential purpose of the National Engineers' Week is to convey to the public a better understanding of the functions of the professional engineer."

Gruehr stated: "A profession cannot fully carry out its fundamental obligation of public service if the public is not aware of the many ways in which the profession can be of service to it. It is therefore, one of the duties of a profession to keep the public informed as to what the profession does and how it affects everyday life. In the case of such professions as law and medicine it would seem hardly necessary to explain their functions to the public. These professions are well known because long ago they realized the need for establishing good public relations and they have carried on appropriate and successful programs of public information. The American Bar Assn. and the American Medical Assn. and their state and county units still continue this work and regard it as one of their most important functions.

Because of its division into numerous technical societies, the engineering profession as a whole has never undertaken a program to make its functions known and appreciated by the public. Yet in these days, more than ever before, it is becoming essential for our profession to do so.

The struggle for the survival of the free world is largely a technological struggle in which the professional engineer plays a vital and indispensable role. Continuance of our way of life is dependent upon maintaining our position of technical supremacy, which demands the highest quality of technical ability. To maintain America's present leadership, it is essential that we attract the most talented, the most creative minds of our young men and women to engineering and scientific pursuits.

"It has been truly said that the finest youth are attracted to that profession to which their country attaches most prestige. In totalitarian countries, a few men can decree which profession shall have such prestige. Behind the 'iron curtain', strong incentives are offered to young men and women to follow engineering and scientific careers. In a free country like ours, we must attain the same result by selling the idea that the building up of the prestige of the engineering profession is the patriotic duty of every member of our profession. This can be done more effectively by a continuous program of public information."

On Feb. 17, two days before the official beginning of NEW, Harold E. Stassen, special assistant to President Eisenhower for disarmament, will be the principal speaker at the spring banquet of the National Society of Professional Engineers in Washington, D.C.

The two-day business and professional meeting of the 36,000 member society will feature the formal dedication of the group's newly constructed headquarters building at 2029 K St. in the northwest section of the nation's capital.

The banquet will be the "kickoff" for similar affairs to be held throughout the country during NEW.

To the engineer with a bent for research...

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That's why we need creative engineers . . . and appreciate them. You who qualify for an AiResearch position will receive stimulating assignments, utilize some of the finest research facilities in the country and be well rewarded financially.

TEST OF TIME *passed by small gas turbines at AiResearch, with proved performance in the field. AiResearch has developed and produced more small gas turbines than any other company in the world.*

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Write to Mr. Wayne Clifford, AiResearch Manufacturing Company, 9851 S. Sepulveda Blvd., Los Angeles 45, California. Indicate your preference as to location between Los Angeles and Phoenix.

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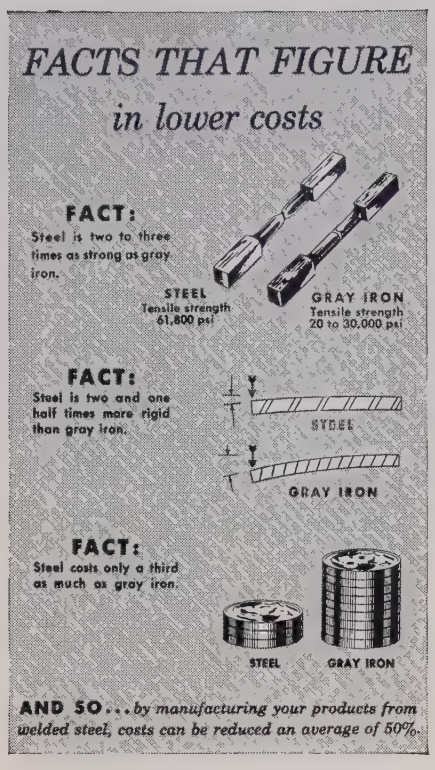

FACTS THAT FIGURE
in lower costs
FACT:
Steel is two to three times as strong as gray iron.
STEEL
Tensile strength 61,800 psi
GRAY IRON
Tensile strength 20 to 30,000 psi
FACT:
Steel is two and one half times more rigid than gray iron.
STEEL
GRAY IRON
FACT:
Steel costs only a third as much as gray iron.
STEEL
GRAY IRON
AND SO... by manufacturing your products from welded steel, costs can be reduced an average of 50%.

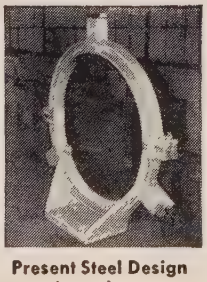
SUCCESSFUL DESIGNS MUST FIRST BE LOW IN COST

The first demand on every design is low cost to meet price competition. Therefore, as a product engineer you must be sure your designs are economical to manufacture and use the fewest pounds of the lowest cost materials that will do the job.

Study the facts in the above chart. They show you how drastic savings in materials can help you cut the costs of manufacturing machinery up to 50%.

Here is a machine part . . . a steady rest for a machine tool. By using welded steel construction, the designer has cut down weight, yet has made the component stronger and more rigid to build accurate alignment. The cost of producing the welded steel steady rest is 36% less.

Original Design *of steady rest*



Present Steel Design *of steady rest*

Data on Designing for Steel is available in Engineering Bulletin and Handbooks by writing

THE LINCOLN ELECTRIC COMPANY
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Telling the Story

The following editorial, appears in the March 1956 issue of the Westinghouse Engineer.

Engineers today constitute but a small fraction of one per cent of our total population. Yet nearly everything we do or have is in some way affected or enhanced by engineering. Engineering builds our bridges, furnishes our water supply, controls rivers, furnishes our electric power—and the thousands of household and industrial devices that use it; it digs tunnels, produces airplanes that fly faster than sound, and nuclear submarines that can go around the world non-stop and without surfacing; engineering helps grow better agricultural crops, and even figures in such common items as fountain pens and toys. You name it; the chances are that engineering is involved.

Yet despite the amazing role played by engineers in our modern civilization, engineering is probably not a well-understood profession. Well known, yes, but not well-understood. In a sense, engineers have done their tasks too well and told about it too matter-of-factly. They have produced so many wonders that the general public accepts them with too little appreciation of the creativeness, not to mention the plain hard work, involved. The end results that engineers have produced have won them recognition; but for engineering to serve most effectively its obligation as a public service, there must be more awareness of the whys and hows of engineering. The story of *engineering* must be told, as well as the story of the devices and structures it builds.

One such effort to produce greater public awareness is the annual National Engineers' Week, held this year from February 19th through the 25th. Using all available communications media, a concerted effort was made to acquaint the public with many of the achievements of the engineering profession. This annual spotlight is a very worthwhile effort—but once a year is not enough. To any who can help tell the story of engineering, every week should be "engineers' week." The stories to be told are multitude.

The need for greater public awareness of engineering has many sides. But one, at the moment, seems extremely important to the welfare of the country. This concerns the task of attracting more young people to the engineering fields. Little needs to be said about our present shortage of engineers. Raising the general prestige of the engineering profession will help, in itself, provide more incentive. This is but one reason for the need for greater public awareness; others are equally obvious.

The task is not one that can be performed by any one group alone; group efforts must be supplemented by individual efforts. Every engineer must, by example, serve as an incentive to others to enter his field.

The methods are numerous. Participation in community affairs, talks before civic groups, clubs, and schools are a few examples. Many engineers are already doing these things, but there is plenty of room for more activity.

The engineering profession is one of the few that nearly always produces a material result—one that is tangible and visible. Whether the result is a toaster on the breakfast table, a mile-long bridge, or a generator that serves a whole community with electric power, the story behind it can be a fascinating one, and one that should be told.

Engineering is not simply a profession in which facts are collected and an answer falls into place; neither is it one in which the solution of a few mathematical formulae is sufficient to produce a new device. It is a profession which has at its disposal all the known scientific information yet discovered by man; it is therefore a profession requiring the ultimate in ingenuity, creative ability, and common sense, to put this information to the best practical use. This story needs more telling.

Paul Johnson, annoyed by a tax bill for three cents, bought a postage stamp, hid it in a huge bundle of paper and sent it off to the tax department.

He added the rhyme:

"Hi diddle diddle, the stamp's in the middle." Back came the stamp with the reply:

"Hip hip hooray. You still have to pay. Stamps aren't accepted anyway."

* * *

Some girls are like a zippered nighty; pull anything and it's all off.

* * *

Ch.E.: I called up that cute girl in the office and asked if she was doing anything that night. She said she wasn't, so I took her out myself, and sure enough, she wasn't.

Openings for Engineers at

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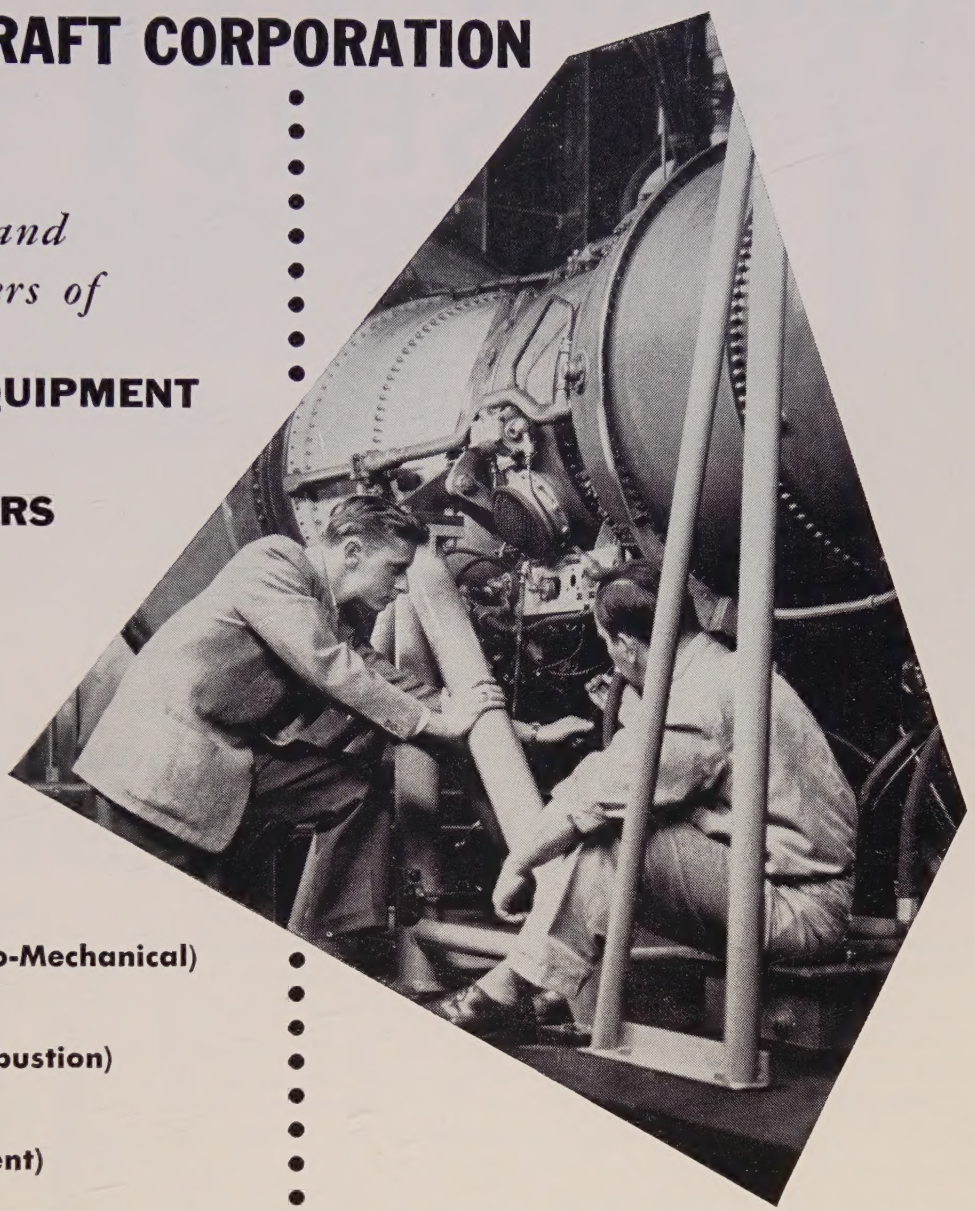

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HAMILTON STANDARD

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WINDSOR LOCKS, CONNECTICUT

BRAIN TEASERS

by Larry Kiefling, M. E. '56

1. A church hymn board has four grooved rows on which the numbers of four hymns chosen for the service are placed. The hymn book in use contains 700 hymns. What is the smallest number of number plates, each carrying one digit, which must be kept in stock so that the numbers of any four different hymns selected can be displayed; and how will the result be affected if an inverted 6 can be used for a 9?

2. A man stakes $\frac{1}{m}$ of his fortune on each play of a game whose probability is ½. He tries again and again, each time staking $\frac{1}{m}$ of what he has. After 2n games he has won n times and lost n times. What is his result?

3. A man has 64 pounds of sand. He needs to use only 50 pounds, but what he uses must be a representative sample of all the sand. He has a riffle which splits any amount of sand into two representative samples of the same weight. What is the least number of times he must use the riffle to obtain his 50 pounds of sand?

4. If a tree 30 inches in diameter has a notch cut to the center, what is the volume of the wood removed if the lower plane of the notch is horizontal and the upper plane makes an angle of 45 degrees with the lower plane?

5. Three Indians, two Crows and one Blackfoot, were confronted by a tourist. Now Crows have the habit of always lying to tourists, but a Blackfoot never tells a lie. The tourist, aware of these habits, asked the first of these Indians his nationality. The Indian replied in a dialect which the tourist could not understand. So he asked the other Indians what the first had said. The second replied that the first said he was a Crow, but the third answered that the first had said that he was a Blackfoot. If you were the tourist what would you say was the nationality of each Indian?

6. There was recently a sale of various articles of ladies' apparel on the second floor of a downtown department store. A young woman and her grandmother were rushing to get to the sale before the best bargains were all gone. They reached the foot of the escalator going from the first floor to the second floor at the same time and stepped on the first step together. Since they were both in a hurry to get to the sale, they did not stand still and ride the escalator up, but walked up, both at a constant rate, until they reached the top. The young lady forgot that her grandmother could not keep up with her, and walked as fast as she could. The older woman was only able to take one step for every three that her younger companion took. Of course, when the young woman reached the top, she had to wait for her grandmother, so she didn't gain anything by her rushing. The granddaughter took 36 steps, her grandmother took 24 steps. How many steps were in sight at one time on the moving staircase?

7. A man in a small hotel had no money to pay for his room, but expected a sizeable sum in 24 days. He had a valuable watch chain with 23 links and persuaded the inkeeper to accept one link per day as security. Into what lengths could he divide the chain by cutting only two links and meet his obligation without ever allowing the innkeeper to hold more than his due?

8. The number of peas in a jar when divided by 5 has a remainder of 3, divided by 9 has a remainder of 7, by 11 a remainder of 2, by 14 a remainder of 1, by 17 a remainder of 10, and by 19 a remainder of 9. What is the smallest possible number of peas?

9. If the sequence of numbers starting with 1 and going up to infinity were written out as if it formed a single number, the result would look like this:

12345678901112131415161718192021222324252626282930313 2.....

If a person were to start counting the digits of this sequence, starting with 1, which digit would occupy the 940,578th place?

Can you replace the letters in the problems with the proper digits?

10.
```
  HOCUS
  POCUS
 -------
  PRESTO
```

SOLUTIONS

1. 86, but only 81 if an inverted 6 can be used for a 9.

2. After 2n games he will have

$$A(1+1)_n\ (1-1)_n = A(1-1)_n < A\ \frac{m}{-}\ \frac{m}{-}\ \frac{m_2}{-}$$

A being the amount with which he began. He always loses.

3. The least number of times the riffle could be used is 5 times. After splitting 5 times, samples weighing 32, 16, 8, 4, and 2, pounds are available. Adding the 32, 16, and 2 pound samples gives the 50 pound sample.

4. The volume is 2,250 cubic inches.

5. By logic it is found that the first Indian was a Crow, the second a Blackfoot, and the third is a Crow.

6. 48 steps.

7. The man cut the fourth and eleventh links, leaving sections of 3, 6, and 12 links, plus the two single, cut links. On day

1. he gave a single link
2. gave second single
3. took back singles and gave 3-link
4. gave single
5. gave second single
6. took back all previously given and gave 6-link
7. gave single
8. gave second single
9. took back singles and gave 3-link
10. gave single
11. gave second single
12. took back all given and gave 12-link
11. through 23: essentially repeat 1 through 11, leaving 12 links in possession
24. stalled off landlord until money arrived, then bought back chain, plus paying 24th day's rent.

8. 673 peas.

9. A 5, the 3rd digit of 175,281.

10.
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  92836
  12836
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 105672
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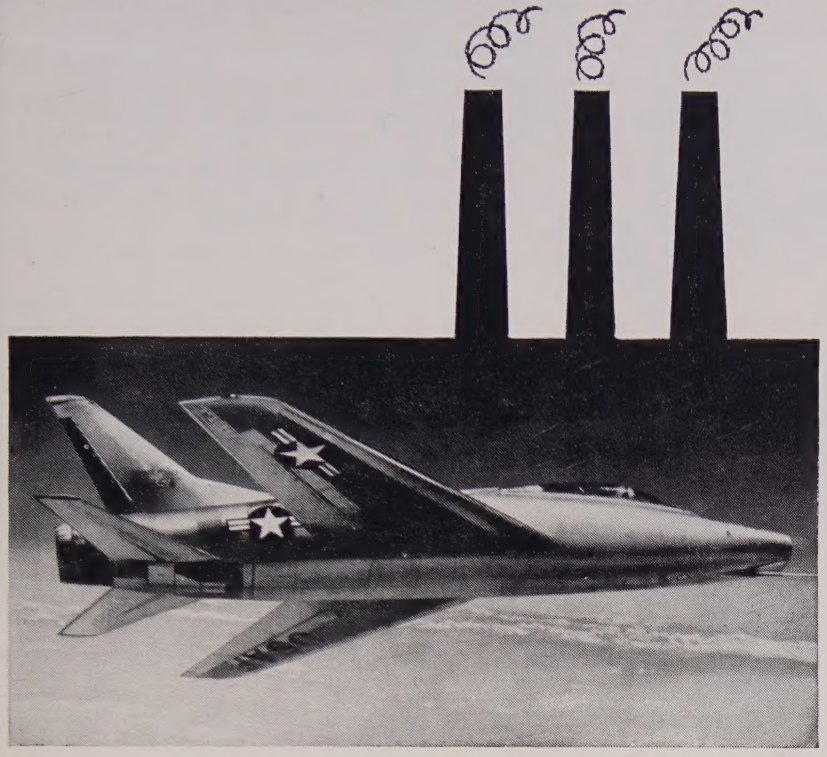
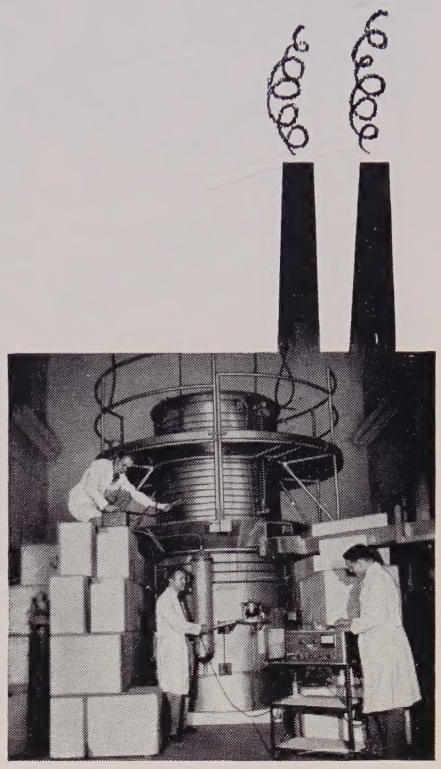
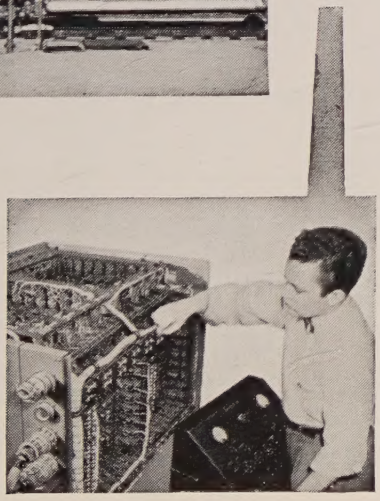
NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD





At North American—

DIVERSITY CREATES OPPORTUNITY



Graduates, undergraduates—A North American representative will be on your campus soon. He will give you complete details on the hundreds of openings these expanding fields create: AIRCRAFT: the Korea-famed F-86 SABRE JET, the record-smashing F-100 SUPER SABRE, and Airborne Vehicles of the Future. GUIDED MISSILES: the SM-64 NAVAHO Intercontinental Guided Missile. ELECTRO-MECHANICAL CONTROLS: fire controls, automatic navigation systems, flight control computers—for aircraft and missiles. ENGINES: lightweight, high-thrust rocket engines for the NAVAHO and for other missile programs. ATOMIC ENERGY: the development of nuclear reactors for research, medicine and power.

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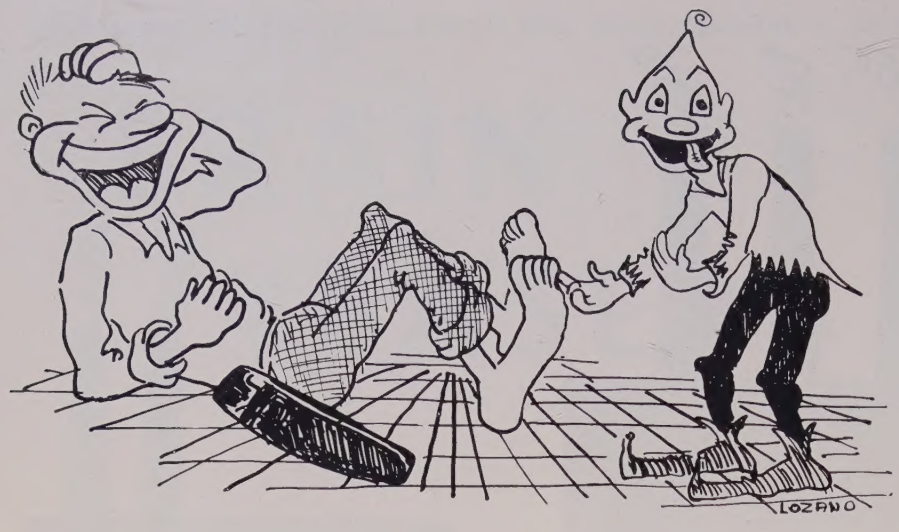
ENGINEERING AHEAD FOR A BETTER TOMORROW

NORTH AMERICAN AVIATION, INC.



TECHNOCRACKS

M. E. TEST PROBLEM No. 2

A crosseyed woodpecker with a cork leg and synthetic rubber bill required ½ hour to peck ¼ of the distance through a cypress log 53 years old. Shingles cost 79 cents per hundred and weigh 8 pounds apiece. The log being pecked upon is 34 feet long and weighs 46 pounds per foot. Assuming that the coefficient of friction between the woodpecker's bill and the cypress log is 0.097 and there is negligible resistance to diffusion, how many units of vitamin B1 will the woodpecker require in pecking out enough shingles for a $75,000 barn with detachable chicken house? The woodpecker has an efficiency of 97 percent, and gets time and half for overtime.

* * *

A couple of sailors laying over for a day or two in Sweden decided to go to church. Knowing no Swedish, they figured to play safe by picking out a dignified looking old gentleman sitting in front of them and doing whatever he did.

During the service the pastor made a special announcement of some kind, and the man in front of them started to rise, at which the two sailors quickly got to their feet, to be met by roars of laughter from the whole congregation.

When the service was over and they were greeted by the pastor at the door, they discovered he spoke English and naturally asked what the cause of the merriment had been.

"Oh," said the pastor, "I was announcing a baptism and asked the father of the child to stand."

* * *

Said a feminine voice from a parked car: "Whadda you been drinkin' rubbing alcohol?"

Golf is a game in which a ball 1½ inches in diameter is placed on another ball 8,000 miles in diameter. The object is to hit the small ball but not hit the large one.

* * *

Ch. E.: "Are you troubled with improper thoughts?"

Date: "Why no, I rather enjoy them."

* * *

The young lady didn't have any trouble talking her boy friend into buying her a dress—the trouble came later on when he tried to talk her out of it.

* * *

"This college turns out some great men. When did you graduate?"

"I didn't graduate, I was turned out."

* * *

He: "Do you mind if I turn off the light? I freckle easily."

* * *

They say opposites attract. Do you suppose that's why married men are attracted to single girls?

* * *

"I wish I had enough money to buy an elephant."

"What would you do with an elephant?"

"Nothing. I just want the money."

* * *

When Noah sailed the waters blue,
He had his trouble, same as you,
For 40 days he drove the Ark
Before he found a place to park.

* * *

Joe: "She's a vision of beauty. A regular mirage."

Gus: "I get what you mean but you are using the wrong word. A mirage is something you can see but can't feel."

Joe: "That's her."

The designer sat at his drafting board;
A wealth of knowledge in his head was stored;
Like "What can be done on a radial drill,
Or a turret lathe or a vertical mill?"
But above all things, a knack he had
Of driving gentle machinists mad.
So he mused as he thoughtfully scratched his bean
"Just how can I make this thing hard to machine?"
If he made this body perfectly straight,
The job had ought to come out first rate.
But t'would be so easy to turn and bore
That it would never make a machinist sore.
So he'll put a compound taper there,
And a couple of angles to make 'em swear,
And brass would work for these little gears,
But it's too damned easy to work, he fears,
So just to make the machinist squeal,
He'll make him mill it from tungsten steel!
He'll put those holes that hold the cap
Down underneath where they can't be tapped;
Now if they can make this, it'll be just luck,
'Cause it can't be planed and can't be ground,
So he feels his design is unusually sound,
And he shouted in glee "Success at last!
This damned thing can't even be cast."

* * *

A psychiatrist visiting an insane asylum noticed one of the patients huddled, all alone in a corner, busily scratching. "Why do you spend your time there scratching yourself?" he asked.

"Because," said the inmate, "I'm the only person in all the world that knows where I itch."

* * *

An overly-inquisitive motorist drew up beside a car parked on a lonely road.

"Hey, you two in there! Got motor trouble?"

"Nope."

"Out of gasoline?"

"Nope."

"Tire down?"

"Didn't have to."

* * *

A salesman making a week's stay in town bought some limburger cheese to eat in his room. When he got ready to leave, he still had part of it left. Not wanting to pack it or leave it lying open in the room, he went to the window-sill, carefully removed a plant from the pot, buried the cheese and replaced the plant.

A few days later he got a telegram from the hotel: "O.K., we give up. Where in hell did you hide it?"